



# ***JPRS Report***

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### ***AVIATION & COSMONAUTICS***

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# Soviet Union

## AVIATION AND COSMONAUTICS

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[The following are translations of selected articles in the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow. Refer to the table of contents for a listing of any articles not translated.]

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### Letters to Editor Spotlight Obstacles to Reforms

91SV0011A Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 12, Dec 90 (signed to press 14 Dec 90)  
pp 2-3

[Article by Colonel A. Zhilin under the rubric "Reader—Journal—Reader": "A Sad Echo of Bravura Marches—Reflections on Letters to the Editor at the End of the Training Year"]

[Text] So the finish of the latest stage of the continuous marathon called the service has passed. For some it is the first, surmounted without being short of breath, so to speak, and calling them forward toward positions and ranks and the pinnacle of professional mastery. For others it is the last, when the power, health and the best years of life have been given over to serving the Fatherland. And a question preys on the mind of veterans: how will society greet them—with a laurel garland or with silent neglect of the problems that have appeared?

Yes, this time interval has been memorable in its own way for everyone. One common feature of the year that has passed, in my opinion, is that it was devilishly contradictory and equivocal in substance, since it included each one of us in the fight of new against old in one way or another without revealing the victors, demonstrating a rough equality of forces. And therefore the old thinking and stereotypes in the combat training of military aviators are still solidly holding their positions, inflicting harm on the professionalism of the personnel and continuing the moral deformation of the people. Positive changes cannot ensue, to put it figuratively, in afterburner mode, because many of us have not gotten rid of the stagnation virus of socio-political and professional immaturity.

The letters to the editor testify that discussions of military reform and improvements in the combat-training system are moving bit by bit from the lobbies into the classroom, and are being legitimized at sessions of the instructional councils of the units. "Issues connected with improving the professional training of crews in our regiment have begun to be considered in more topical fashion. This entails making the instructional council of the unit more active first and foremost," writes combat pilot 1st class Major A. Borovchenko to the editors. "All of our activity used to be subordinated to the blind worship of documents coming from above. And since many of them were of a general nature, combat training was structured in roughly the same way. The main thing was to support the logging of flying time, and few cared about the actual training level of flight personnel. Today we discuss how to raise the effectiveness of the teaching process more often and in more concrete terms. Even though it is all just discussions and debate so far, it is a shift. After all, it used to be forbidden to talk about this..." reports Captain I. Novozhilov.

I admit that there are still too few letters on positive changes in martial affairs. But it is not for nothing that I

have begun the survey of letters to the editor with them nonetheless. These "bricks" of the new, the optimal and the sensible, from which the laying of the foundation for a new "building" for combat training is beginning, have enormous significance at this crucial moment, when the stereotypes of the organization of the teaching process are being destroyed, when the reformation of the armed forces is not far off. The aviators of the line units should lay the foundation. Do the conditions for this exist?

Judging by the letters, too few as yet. Restructuring the activity of personnel depends largely on the stance and level of training of the commander. If he is a progressive and decisive person with initiative, a moral and businesslike enthusiasm will be observed in the collective, and the vested interest of the fliers in the results of their work will increase. If, on the other hand, the principle of "it will come to no good" is professed, apathy, pessimism and hopelessness will be observed. Restructuring in the army up to the present day, in other words, is dependent on subjective factors. That being so, we cannot speak of any irreversibility in the process of it.

Lieutenant-Colonel (Reserve) M. Yevseyev feels that "the most difficult thing in the impending military reform is to find people able to move it forward. They exist. But there are few of them. The majority of them are moreover out of favor. The bureaucratic army regime of the time of stagnation was entirely content to cultivate a whole constellation of senior officers wholly dependent on the existing system. Innovative commanders were always a nuisance, since they spotlighted the lack of talent of those around them both above and below." Stated sharply and categorically, perhaps, but... Most of the letters to AVIATSIYA I KOSMONAVTIKA are permeated with mistrust of radical changes in the process of combat training, testifying that a similar viewpoint is widespread among the troops.

The appeal to the editors by a group of fliers from the navy is typical in this regard. The essence of it is as follows. Regimental commander Lieutenant-Colonel T. Apakidze had only to set about the restructuring of combat training in deed rather than in talk to become unsuitable to his superiors. The commander, despite the fact that the approaches used by Apakidze toward organizing the teaching process facilitated a truly unique rise in the professional skills of the pilots, was ultimately demoted. Reasons were quickly found.

The letters from fliers, to summarize the viewpoints set forth in them, give an alarming signal that today, at the threshold of military reform, a dangerous situation has taken shape. The representatives of line units, as keepers of the truth of the state of combat training and the trends in reforming it, are actually being deprived of the opportunity of affecting that process. Their opinions, if taken into account at all, are counted only in formalized fashion. The personnel have once again been placed in the role of awaiting prescriptions "from above," only with the difference that this time the center will not tell

anyone how to fly and shoot, but rather who will implement the reforms and how, which is essentially the same thing.

"Has the strict regulation of combat training here really taught us nothing?" Is it really not clear to anyone yet that directives from the center on who must do what engender nothing but crash work and the substitution of one senior officer for another? I am afraid that this is what will happen to military reform as well. The army 'brass' has long been separated from the 'ranks' and thus does not possess complete information on just how combat training must be restructured," writes Lieutenant-Colonel (Reserve) N. Melikov. The questions raised by the former military pilot are not rhetorical ones, as it could seem at first glance. Many are troubled today by the fact that, if the military reform proceeds exclusively from above, its effectiveness will be, to put it mildly, less than that expected among the troops. And the point here is not that the army "brass" has long been separated from the "ranks." The greatest danger lying in wait for us in the process of reforming the armed forces, in my opinion, consists of ignoring (judging by the letters of readers) feedback. That is, they evidently intend to pursue reform using rigid administrative-command methods. This means, whether the reformers want it or not, the transformations will at best only indirectly affect the interests of those for whom, strictly speaking, they are being implemented, in particular the representatives of the line units of the air force. Interests here should not be understood to mean social benefits, but rather a new system for training the professional warriors of the air.

It is no accident that officers N. Spiridonov, A. Matviyenko and N. Laktyukhov, in appealing to the editors, state that military reform should proceed from below, not from above. What are the pilots and engineers afraid of? First of all, that the existing shortcomings not migrate to the new system of combat training. Their apprehensions are not groundless, since, judging by everything, the main flaw remains unaffected—the teaching process will be safely enclosed by a fence of every kind of regulating document, without taking into account the individuality of its participants. Potential aces and masters of aerial battle will once again be dissolved in average statistical indices and reports as a result. One thing is clear—until reliable feedback is set up in the system of combat training, albeit in the form of an efficient accounting for the opinions and suggestions of officers in line units, pretentious slogans will not advance us any further—including in military reform. The ineffective decrees of the president of the USSR are confirmation of this. Even with his authority, he is unable ensure their fulfillment, since the structures for their realization are dead.

Many letters come to the editors whose authors touch on problems of increasing flight safety. Hints of satisfaction on how the attitude of commanders and superior officers toward mistakes committed by pilots in flight are being encountered more and more often in them. "They used to accuse the pilots groundlessly for any imprecision.

Your journal has written about this repeatedly. The opportunity of objectively investigating what happened is being presented more and more often now. I connect this with the fact that more and more leaders have been appearing at the rudder of the air force who understand that the pilot himself is not the enemy. Thanks to them for understanding that..." writes Major S. Trofilyuk. Military pilot 1st class Lieutenant-Colonel A. Butkov adds, "The impression is taking shape that the flight safety service headed by Colonel-General Aviation Ye. Rusanov is being restructured to focus on seeking out the reasons for flying accidents, rather than determine those to blame. Hopefully this impression is not a false one!"

There are other viewpoints as well. "We talk and write a lot about flight safety. Meanwhile, flying time for pilots is less and less. We have almost double the complement of flight personnel in the unit—just try and provide the optimal flight time!" objects Major N. Kondratyuk. He is echoed by Captain L. Manashkin: "Before adopting documents aimed at increasing flight safety, we pilots must be provided with sufficient flying time. The less we fly, the higher the accident rate. Can the air force leaders really not understand this?"

Many such statements by fliers could be cited. They moreover direct most of their indignation at the air force high command—they do not understand these simple things there, they say. Yes, matters are difficult with flying time in the line units today. But is the high command really to blame? Take a look at how the withdrawal of troops from the Eastern European countries was organized—faster, faster! It must be understood these decisions are not made at the level of the air force command, or even at the level of the minister of defense. I personally doubt very much that anyone was interested in asking the air force command how they would threaten the air force before they were made. I think the command, like all of us, was most likely presented with the *fait accompli*—it must be done!

Yes, there really are more pilots than planes in some units now. Flying time is naturally being reduced. But what can you do—this is a forced measure. If there are other concrete suggestions, the editors await them. But it seems to me that with the situation the air force is in unwillingly, it is hardly possible to find a different method of keeping the flight personnel in the formations.

I want to be understood correctly. I am far from trying to direct all of the anger of the fliers in the line units against the president and the government of the country. I see no point in it. Our government is so paralyzed by the crisis of leadership, in my opinion, that it is unable to react in suitable fashion to anything. I am simply trying to bring the truth to the readers, which is, to my mind, as follows. Today we are nonsensically indignant at the additional difficulties in combat training that have arisen due to the withdrawal of our troops from Eastern Europe. They will not diminish from our shouting about them at meetings and demonstrations. On the contrary. Constructive steps

to overcome them are needed. No one except we ourselves will point the way out of the grave situation into which the air force has gotten. We must realize this. That is why the editors are waiting not only for the indignant letters of readers (they are important as a barometer of public opinion), but also materials that are profound in substance with concrete answers to the question, WHAT IS TO BE DONE?

We recall how quite recently each training year was accompanied by the sounds of orchestras. The summary reports abounded in triumphant communiqués—so many hours of flight time accumulated, so many LTU [tactical air exercises] held, average proficiency ratings increased by so much... The echo of bravura marches is sad, whatever you say... Will we be able to change the score?

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#### Editor-in-Chief Anuchin Discusses Editorial Policies

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p 3

[Article by Colonel V. Anuchin, editor-in-chief of AVIATSIYA I KOSMONAVTIKA, under the rubric "The Editor's Column": "Dear Readers!"]

[Text] Six months have passed since the journal AVIATSIYA I KOSMONAVTIKA made a radical change in its creative policy. This was a difficult period, contradictory in substance, for the editorial collective. First of all, we strove and and striving to take into account in our work all of the desires and recommendations of our subscribers and to diversify the content of each issue as much as possible. It is extremely difficult to do this with the existing number of publications, since the majority of the readers have their own views of the journal and their own tastes and requirements. They demand that we print more historical material, while others, on the contrary, are for more detail on the problems of contemporary aviation etc. But we will strive for an optimal combination of the most diverse information in the future as well, so that no one is offended.

Second, the editors receive many reproaches from subscribers on the score of the quality of the illustrative materials and delays in delivery of the journal. They are fair. But the steps that are being undertaken to rectify the situation are not producing any results as yet, since much depends on others. The printing equipment of Voenizdat, as well as the organization and support of the publishing process, do not make it possible to attain a contemporary level of printing. All of the efforts of the journal staffers are often for naught. The constant shortage of paper disrupts the deadlines for the issue of the publication, while the sluggishness of Soyuzpechat aggravates the situation even more. There is the hope, however, that the situation will change for the better next

year, with the entry of imported equipment into operation and the imposition of penalties.

Third, the attempts of the journal to take a stance on many fundamental issues is not to the liking of everyone. But it is, strictly speaking, simple and obvious—every flier, specialist and veteran, among others, can express his own viewpoint on this or that problem. We have no more topics that are closed to public discussion!

The editorial collective, despite these and other difficulties, considers its main task today and the for long term to be continuing the fight for social, legal and professional protections for fliers and to reflect objectively all of the processes transpiring in the air force, as well as to pursue honest and candid discussion of what keeps our aircraft from being better. I would like to say something on that score. Certain circles have lately tried to accuse the journal of abusive criticism. But the essence of it is that we have just ceased to publish wishful thinking in place of reality, and are striving to analyze the state of affairs in the air force in comprehensive fashion. And there can be no constructive changes, as is well known, without the critical interpretation of what has occurred. It is not covering up we need, but rather an answer to the question of how to raise the effectiveness of combat training and flight safety. Positive experience in restructuring combat-training activity for the personnel, after all, not just opportunistic spur-of-moment experience, does exist in the subunits and units. So report it. We are most ready to publicize it, to make it the property of everyone! And we are hoping for the energetic and fruitful activity of the military-correspondent posts that have been created among the troops.

While expressing sincere gratitude toward the readers who are supporting the endeavors of our publication, I would at the same time like to ask of the rest that they cast aside the role of detached observer, not remain silent, but rather write to us about their problems, send in material with suggestions on how you view military reform and how the crisis in military training can be overcome. Make active use of the "Trust Service" that has been opened up in the journal, the mission of which is to help us find answers to questions not only connected with the psychology of flight work, personal life, medicine etc., but also purely professional ones pertaining to flight tactics, navigation, aerial firing and piloting training, flight safety and the organization of the training process.

I repeat once again that our strength is in mutual support, in unity and an energetic public stance. Your letters, articles and subscription are the independence of the journal. And the independence of the publication is our public protection, the opportunity of defending ourselves and our opinion.

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**New Approaches to Training, Flight Time Discussed**

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pp 4-5

[Article by combat pilot 1st class Lieutenant-Colonel A. Tokarenko under the rubric "For High Combat Readiness": "Testing by Initiative"]

[Text] *The fliers of the squadron of combat pilot 1st class Lieutenant-Colonel A. Tokarenko are undergoing testing by initiative, having in fact decided to organize combat training in a new way. The commander himself relates how they are succeeding.*

No, it was not for nothing that the wise men said at one time that the most simple and obvious truths are complex at first glance. We came to be convinced of the justice of these words ourselves as well. Who among us has not had to summon oneself and one's comrades, say, in true and heated fashion to the display of energy, initiative and enterprise in the name of raising combat readiness? The game slogans sound from the podium at the party meeting or conference, but having scarcely crossed the threshold of the classroom where they were joking, you see, the majority are striving to get back onto the old, well-worn official-living tracks.

Didn't they at least try to realize some of these slogans? Or didn't they want to? An unequivocal answer is perhaps difficult. Most likely the System did and does lie heavy on us, assuming the diffusion of the personality across the whole range of "colors" of the moral and ethical spectrum, thinking one thing, saying another and doing something else...

Yes, we were put under conditions where the process of combat training and all of our life proceeded as if on autopilot, without any special expenditure of "gray matter." And this is a direct route to mediocrity, which is, judging from everything, where we ended up. Need we be surprised, after all this, that the difficulties that have come crashing down on us this year—the dual set of personnel, the reduced annual total flying times, the aircraft that are long due for major overhaul—have stooped us thoroughly at first? I admit that we will get better with great difficulty, as after a chronic illness.

I want to state immediately that we have used nothing supernatural to get out of this situation. We tried to organize the training process as it should be, without simplifications as much as possible. And this in turn required a display of creative initiative by each flier. It turned out, however, that making use of the greater freedom is the greatest difficulty. And everything is consistent therein. Try to utter the word "initiative" mentally, and I am sure that the companion word "culpable" will appear alongside it in your mind at once. We learned to keep initiative underground over the long year of the dictate of the administrative-command System. We are still afraid of legalizing it entirely—what

if everything that goes around, comes around tomorrow? And never mind about tomorrow! Today, now, most of those who have displayed that initiative, boy are they going to get it!

There's nowhere to go, however. In order to get out of the dead end, we had to get rid of stereotypes of thinking and, naturally, action. We tried first and foremost to do it so that there was not a single formal flight just for the sake of "checking off the boxes" in various plans and schedules.

In order to handle that task more or less successfully, we had to study individual specific features and assess the professional preparedness of each pilot anew. And what was noteworthy was that it turned out we had fallen into the illusion that we know each other. Fat chance! We didn't even know ourselves clearly, since that wasn't terribly necessary before. The image of some statistically average pilot 1st, 2nd and 3rd class had been formulated "automatically." The whole process of combat training had been adjusted for statistically average mediocrity.

The individual approach to forecasting the procedure and evaluating the quality of the assimilation of new programs of flight training, in the face of acute shortages of flying time, made it possible for us to establish the "ration" of flying time for each pilot that would ensure the level of combat readiness that was attainable in a given situation. We had to take away a portion of the flying time of the experienced pilots, leaving them with the limit of the minimum norms, for the sake of the young pilots in particular in order to "strengthen the wing." This was a forced measure. There was no necessity for it had I, the commander of the squadron, been endowed with the right to proceed from individual or, in other words, realistically necessary flying-time norms for each pilot in planning flight training, rather than be engaged in arithmetical tightrope-walking with numbers that are handed down from the higher headquarters.

Why did we devote increased attention to the young? Because it is namely in the first years of the service that the "flying foundation" for the whole flying life takes shape in the line unit. Then comes either polishing of skills, or futile attempts to make up for what was omitted. That is axiomatic. And the overall misfortune of the Air Forces is the fact that it is often repeated as a truism, and just as often ignored. The young, by the way, are our future, and what it will be—good or bad—depends on them, the squadron commanders, and not the higher headquarters. It is time for those at the helm of air power to understand that. We still do not have suitable conditions for full-fledged work with lieutenants—there is no possibility of incorporating new explanatory techniques into the practice of flight training, the appropriate literature is lacking... There is an abundance of directives alone, declarative slogans on improving individual work. The command exam has to be structured on a scientific-instruction basis, and not instinctively.

Be that as it may, we have nonetheless been able to come to agreement with the collective on the main thing—intelligent initiative is needed everywhere, even in places where it was impossible to display it yesterday. It was decreed that there would be no digressions from the requirements of the basic documents regulating flight operations, not a single step.

I suspect that some fliers, having read these lines, will accuse me of demagoguery and even hypocrisy. We know, they say, what those documents are directed toward—the realization of the principle of the more you keep your head down, the further you get! I want to dwell on this in more detail for that reason.

Many of the documents that guide us are partially outdated, frequently bind initiative and assume simplification in the military arts. They are all like that! But it is not quite so. One can find among the stream of documents ensuring the security of the senior officers those that allow us to be at least partially emancipated. And what to do with the rest, sometimes patently absurd? Let's consider them with a new and critical eye, and openly evaluate their essence at conferences and in the pages of our journal. Enough silence! If we want to be freed of dogma in combat training, we must display the courage of the citizen. Otherwise we will remain slaves forever to the insurmountable circumstances engendered in abundance by the administrative-command System.

A typical instance such as this has arisen in our squadron lately. It has become a rule for all, including the young (despite the regimen of greater favorability being observed in relation to them), that flying must be earned. Not only by desire, but first and foremost by the level of preparedness, a clear depiction of the goals that you should achieve on a specific flight. We have not taken the path of "tightening" tutorship therein. We have, on the contrary, tried to offer maximum independence. But when monitoring preparedness, please be so kind as to report back on "A to Z." This is not done easily. Our adherence to the principle of "whatever happens, happens" is having an effect. We are trying to break the pernicious rule of the time of stagnation—the less standard and the more unexpected the proposal of subordinates, the less its chances of being realized. And this assumes steady growth in the professional and instructional skills of the commanders.

The approach "initiative—quality of training—trust—professional growth" has come to be incorporated in the squadron as of the start of this year. I will not conceal the fact that many at first received it quite pessimistically, but their attitude had changed somewhat by the end of the year. Having experienced their first taste of relative professional freedom, we understood that we already did not want to live in the old way, closing our eyes to the shortcomings of ourselves and others. Today the main thing is that that "unwillingness" grow into a reluctance to live and work in the old fashion.

Our path to freedom and initiative probably does not seem the optimal one to some, even harsh to a certain extent—demand has been increased on each of us, but what can you do, after all, this is the first experiment. And as soon as we speak of professionalism in the literal sense of the word, the approach to its evaluation should be professional as well. An interview with the commander of a squadron in the British Air Force published in the last issue of AVIATSIYA I KOSMONAVTIKA, by the way, is also convincing on that score.

The improvement process naturally proceeds in different ways for all. Senior Lieutenant N. Vaulin, for example, a 1986 graduate, is proceeding confidently according to the program of training for 1st class. But Senior Lieutenant V. Nichiporchik... The man has more than enough desire to fly. But things did not work out at first. Many errors were made in the air. There were objective reasons as well. In the old days it would have been entirely possible to give him up for lost as a pilot. But today, when we have learned to see each other in a new light... No, the collective cannot allow it when the fate of a person wholeheartedly devoted to the sky is broken. I beg your pardon for zeal not characteristic of our brethren, but after all it is practically the most important thing in our command and instructional work to be able to penetrate into the inner world of those under our wardship.

But how can it be done? A matter most delicate, after all! We did not study psychology as we should have in school. The more so in the unit. I gathered together the experienced fellows, invited the deputy for political affairs, and we sat down and mulled over a problem with many unknowns. Vladimir himself, strictly speaking, helped us solve it. He did not retire into himself or get all worked up, he displayed sincerity and, most importantly, assessed his "successes" in self-critical fashion first of all. And matters proceeded. He began to fly. Today he is one of the best in the squadron.

The old rule of life was confirmed in this situation—the fight for the person is effective only when he himself wants to get solidly on his feet as a professional. Otherwise, as they say, the game is not worth the candle.

I want most of all that the reader not get the false impression that we have already crossed the Rubicon of difficulties and unsolved problems, and that the road to the shining future of combat training sprawls before us. Hardly! There are many concerns. And not everyone likes what I have been talking about. And our approach does not always give steady, positive results. Not long ago, for example, we had to part ways with experienced pilot Major N. and young pilot Senior Lieutenant T. Why did that happen, why didn't what we used with Volodya Nichiporchik help? If only I could say precisely! So far I have firmly mastered one thing—it will be disastrous if the person does not have feedback with the collective, ceases to heed the advice of commanders and comrades and loses self-criticalness. All are equal before the laws of flight work.

And the aviation collective has its own pep nonetheless—all of us are fliers, a fraternity of people who love their work, and there is no place in it for people who live according to the principle of “the day is gone, and that’s OK.” Initiative, honesty, devotion to one’s profession, sincerity in relations—those are our trump cards! Perhaps that is why, to a certain extent, that some say of the fliers in our squadron, not without envy, “Look, now they’ve started working on landings at night on runways not lit by floodlights...”

What can we answer to that? The changes for the better that exist, as they say, we have achieved ourselves. No little credit for this goes to Major V. Derevyanko and Captain N. Lakhvich... But can you really list everyone? After all, we are advancing not personally, each in and of himself, but in a single group, the collective. And there will be many difficulties ahead of us. But there can be many fewer, after all, if...

Perhaps it is time for all of us who want concrete radical restructuring of combat training, rather than just for effect, to join together? Why not hold a conference, on the scale of the whole air force, at which the representatives of subunits and units delegated by the collectives would relate in detail their achievements and problems? Let the question of initiative—without which we will be unable to manage—be the main one on the agenda. Until then...

The aircraft of the deputy commander of the squadron, combat pilot 1st class Major V. Derevyanko, went out to the air combat training area. The mission was to strike ground targets using a guided missile under clear weather conditions. This poses no special problems for a proficient pilot. But... over the time that had passed since the reconnaissance of the weather, a thunderhead had moved over the test area. The pilot had the right to reject the launch of the missile and return to base. There would be no complaints against him, indeed. But Derevyanko is Derevyanko. He dropped below the clouds and attacked the target from an angle less than that assigned. Was my deputy taking a risk? Undoubtedly. But in considered and professional fashion. Launch. And... the flight of the missile became non-guided a few seconds after its descent...

And “Enough initiative! Experimenters! Restructurers!” resounded. We had to hear a great deal after that incident. But that is typical. After this incident I was permeated with even more respect for my deputy—a young man, he did not fear acting in a manner that would be demanded by a real battle, as testified to, by the way, by the experience of the war in Afghanistan.

According to results of an investigation into this dangerous situation, no complaints were made against the pilot for the maintenance of all the permitted parameters of launch. A most rare event occurred—after the release, the missile entered its flight trajectory and... the target illumination beam was screened by a column of smoke. You could execute hundreds, even thousands of launches

with the initial parameters employed by Derevyanko, and nothing like that would occur. Nonetheless, according to tradition and despite the clear lack of blame, both the pilot and the supervisor were subjected to administrative disciplinary action “for violating the instructions of the commander.” They were in fact punished for initiative. That is why I want to conclude my feature with a question for the commander-in-chief of the air force: is that so, is initiative punishable as before?

**From the editors:** *We join with the question of combat pilot 1st class Lieutenant-Colonel A. Tokarenko, and hope to receive a reply to it from the appropriate officials.*

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### Use of Computers for Rudimentary Flight Simulation

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pp 6-7

[Article by Candidate of Technical Sciences Lieutenant-Colonel A. Titov under the rubric “Tactics and Modeling”: “Tactical Thinking and the Personal Computer”]

[Text] *Contemporary computer equipment will soon begin arriving at Air Forces units. Military science thus even today faces the task of developing the question of applying personal computers in the process of combat training for fliers. One area for their utilization is the creation of automated workstations (ARM) for the training of pilots for flights.*

The ARM was developed on the basis of a personal computer, making it possible to reproduce sound and color graphics video information. It includes control levers analogous to those on an aircraft, which provides for the interaction of the pilot with an intrinsic program of dynamics for aircraft movement. The automated workstation serves as a supplement to a comprehensive simulator, since it does not allow the complete rehearsal of aerobatic maneuvering skills by virtue of the simplified model of movements and control of the airframe and the lack of acceleration information.

The principal purpose of the ARM is to facilitate the development of tactical thinking and decision-making skills among flight crews under diverse conditions in the ground and aerial situations as set for the flight.

The student, depending on the software that has been developed, may obtain differing depictions of the surrounding space from the screen. The variation which has at its foundation forecasting the development of the flight situation depending on the proposed movements of one’s own aircraft, targets or “enemy” interceptors, missiles (shells) and the like is felt to be the most effective for this. It allows the pilot to assess the results of a decision made at once, without waiting for the conclusion of its realization.

The whole ground and aerial situation is depicted on the screen, for convenience, in such a way that the pilot is looking into the space outside the cockpit along the velocity vector, while the aircraft is in front of him (view from behind). Fig. 1 presents one version of such an indication on the screen of the ARM video monitor. The crew can obtain complete information identical to that for a plane really in the air, or in the form of graphic images (by analogy with computer games) therein.

The pilot controls the vector of the predicted aircraft movement by pointing at a spot on the screen to which it will move. The vectoring mark is placed on a line ahead of the aircraft in flight along a set trajectory. The trajectory of movement of the airborne "enemy" or target is projected from the other side.

How can this system be used?

The pilot, when training for flight with the aid of existing devices for the input of graphical information (coordinate converter, graphical plotting board or digitizer), moving it along a map, enters into the computer the coordinates of the turning points of the projected flight path, the terrain relief, natural and artificial obstacles, the locations of "enemy" air defense, forbidden flight zones (radioactive clouds, thunderstorm activity) and other elements of the tactical ground and aerial situation. The missions then begin to be fulfilled against the assigned background, by controlling the depiction of one's own aircraft on the screen.

The dynamics of the "combat flight" on the ARM can be saturated with a multitude of the most likely occurrences on a real flight, complicating the performance of the mission and unknown to the student ahead of time. The choice of this or that situation (depending on the stage of the flight) is made according to the program in the computer, or at the discretion of the instructor from his workstation.

The pilot assesses the aerial situation according to information from the screen of the video monitor or the corresponding sound signals, makes a decision and sets about its realization. He begins, for example, anti-fighter, anti-missile or anti-AA fire maneuvers employing individual EW equipment, for example. He evaluates the results of the decisions made and his actions right away in accordance with the assigned capabilities of the opposing sides: the "enemy" fighter attack or the automatic tracking of the AA missile system are broken off, the missiles misses or the like. The pilot obtains information on this in the form of the differences in the predicted trajectories of movement, sound signals and "notches" in the depiction of the AA lethal zone or the EW suppression equipment on the screen of the video monitor. The crew currently does not have this information at its disposal on an actual flight, but makes use of the results of preliminary calculations on the ground performed without the aid of computers.

The pilot, fulfilling an assignment at the ARM against a tactical background in a real time frame, as it were enters

the image of the impending combat flight, while the large computer database makes it possible to consider a variety of flight situations visibly and without limitation and to train in making non-standard decisions. If the ARM is operating in the conventional mode without forecasting the flight situation, all of the "training flights" can be stored in the pilot's database for subsequent critique, in the course of which the student assesses the correctness of the selection and the degree of realization of the decisions made, either alone or under the guidance of the instructor.

Experience in performing the tactical air exercises (LTU) of aviation units and subunits of frontal aviation shows that proper attention is devoted to practicing questions of tactical training only using maps and explanatory notes. Only the training conducted at air bases, as well as research LTUs, can be an exception—and even then only partly. The result of this state of affairs is a poor level of tactical proficiency by flight crews.

I want to hope that the development of the ARMs and their incorporation will be met with approval in the line units. The more so as this process should not cause any serious difficulties, since the personal computer has small dimensions, does not require a special power supply or service personnel, is easily hooked up with other devices and its software can be developed in centralized fashion. The essential specialists and physical plant for this already exist.

An expansion of the computer networks in the air regiment in the future will provide an opportunity to create a unified database, which will make it possible to conduct preliminary training of the flight crews for group flights, as well as solo flights, for aerial battle and for the execution of strikes against ground targets as part of tactical groups of various sizes. The dry run of flights on the ARMs with the participation of the whole regiment will become possible, which will, in addition to the "age-old" method of walking it through, provide for diversity in the techniques of pilot training.

The adoption of computer technology into the training process of air units will undoubtedly entail certain material and financial expenditures. They will be recouped with interest, however, by the enhanced level of combat skills in the use of contemporary aircraft systems.

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#### Letters to the Editors and Follow-Up on Prior Features

91SV0011E Moscow AVIATSIYA I KOSMONAVTIKA  
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pp 8-9

[Letters to the editors of AVIATSIYA I KOSMONAVTIKA and unattributed follow-up to prior features]

[Text] The Dream Must Not Be Lost



Does the country need combat pilots? Even though some are now rushing to discredit and "bury" our army, the majority of the Soviet people, I am confident, understand that we cannot get by without the armed forces and powerful aviation. But the many years of oblivion of the interests of the fliers, cumulative social and domestic problems, abnormal workdays and monetary sustenance not equivalent to the labor being expended are making themselves felt as well—competition to enter the aviation schools is dropping every year and is now reaching a critical level. Who will take our place?

These problems are beginning to be understood today, and opportunities for helping are being sought. I think that things will go right in the country, that "conditions for human existence" will be created for us as well. And then one of the most negative factors driving the young away from linking their lives with aviation will fade as well. But will they go for it? Or will they have already formed other attachments by the time it is necessary to make life's choices? It is not worth going into aviation if you do not love the sky. But are we thinking about how that love is born? What are we doing to see that it appears in the young men of our country? It is not for nothing that they say, "He was born to the sky." But after all, a person, if he is not helped, can also pass right by his own fate...

The attraction of the young to aviation must clearly begin from an early age. Not all will become fliers, of course, but encouragement is needed in any profession. But where are the bright and beautiful toy airplanes so similar to today's? Industry is in the best case putting out kits and models from tetrahedrite plastic, neither interesting nor durable. Where are the beautiful calendars and postcards with pictures of modern aircraft and helicopters? Where are the intelligent and bright children's books on aviators? There are too few good pins, stylized patches and emblems. Boys want so badly to speed up the course of time and feel themselves to be pilots even today! Why not put out, for example, caps with aviation symbols, pretty "flight" coveralls with inscriptions on the breast pockets, "Commander," "Navigator" etc.?

Can't be done? The principal objection that we have to read in newspapers and magazines is reduced to the fact that we should not be educating the children to be killers. But it seems to me that a substitution of concepts and the false manipulation of public opinion are underway. Why do those same publications propagandize karate without embarrassment? It is also possible, after all, to kill people using its techniques. If the techniques are used for self-defense, their use is justified. The point is what the weapons are directed toward and how they are used. And since when has it become a disgrace to teach children to defend the Motherland?

There are people in every civilized country who voluntarily take upon themselves the obligation of defending others, suffering burdens and deprivations for the sake of the good of others. This is a difficult choice for a young

person. So then let this choice be an aware one. The profession of protector of the Motherland is as necessary as any other. And a person has the right to prepare for it from childhood, as for any profession. He must be helped.

*Major A. Korobkin, deputy commander of an air squadron (Moscow Military District)*

### **But He Could Have Flown**

I, a colonel in the reserves, combat pilot 1st class and former commander of a fighter aviation regiment of the air defense forces, read the article "The Years Incline to Harsh Prose" (AVIATSIYA I KOSMONAVTIKA No. 6, 1990) and agree entirely with its content. I think that had the appropriate moral climate and morale been created in the aviation units, the state would have lost considerably less that was indicated in the article.

I will cite just one example. Lieutenant Gennadiy Yushkin—a very capable person—came to the regiment with me at one time. He flew in excellent fashion. I can confirm this, because I was with him in the air more than once. But his fate, like so many at the time, was a sad one. Having lost prospects, he wrote off flight work very early—after ten years of service. Even though under other circumstances he could have fulfilled his duties quite a while longer, as I did, flying for 23 years.

My opinion is that you can fly for no less than 20 years in modern fighters, the more so the other aircraft of the air force.

*N. Grokhovskiy (Volgograd Oblast)*

### **Where Can the Specialists Be Trained?**

Dear Editor! I want to share some of my thoughts on the following. The successful resolution of the tasks posed by the minister of defense and the commander-in-chief of the air force to ensure accident-free flight operations, along with reductions in the time periods and increases in the quality of the aerial proficiency of crews, requires a creative search for ways to improve the techniques of flight training. I feel that objective monitoring plays an important role in this matter.

The units of the air force currently possess quite effective objective-monitoring equipment, making it possible to have a substantial effect on improving the techniques of flight training and, through that, flight safety. This equipment includes first and foremost recorders of the Tester type, MSRP and ground flight-information processing devices such as Luch-74, Luch-84, Mayak and the like.

This equipment, as is well known, includes a digital computer for the rapid processing of information. The responsibility of the specialists working on that equipment has increased in that regard.

Aviation specialists from various fields are moreover being brought in to operate the monitoring equipment.

Not a single military educational establishment of the air force is currently training them. This is leading to the fact that the monitoring specialists have to be trained in the regiments (self-study, as a rule), where they do not have suitable teaching materials, or the fliers have to be sent for prolonged detached duty at the plants of the apparatus manufacturers for conversion training, which entails material costs.

In my opinion, therefore, the necessity of purposeful training of specialists in monitoring right at the schools, which would improve the quality of their proficiency substantially, has become acute.

Our Perm Military Aviation Technical School [VATU] currently has a good base at its disposal for the assimilation of monitoring equipment, which is partially used in training specialists on aviation equipment. But the assigned training time does not allow the profound study and assimilation of the operation of monitoring equipment due to the complexity of its design. We are unable to solve this problem at the school ourselves.

And last. Unified information centers for resolving tasks in management, gathering of statistical data and the like could be created in the future on the basis of the ground flight-information processing equipment and integrated aircraft simulators that already exist in the units, which also include digital computers.

I would like to hear and find out the opinions of readers on this problem on the pages of your journal.

*Major F. Latypov, instructor at the Perm VATU*

### **A Dangerous Symptom**

I was talking recently with Majors V. Pesotskiy and A. Shaldin. The officers were complaining that it is becoming more and more difficult for propaganda officers. Democratization and glasnost in the army have created unprecedented political energy among the servicemen. They themselves are seeking the answers to many questions. They are waiting for help from ideological officers in this as well. But are they always able to give it?

Officers V. Pesotskiy and A. Shaldin stand out for the better in this regard, but I share entirely their dissatisfaction with the results of the work. The point is that the level of organization of ideological work today cannot be deemed satisfactory. Say the level that people are informed is growing faster than is possible for the advance receipt of information by the propaganda officers so as to react to it. That is, we do not have enough efficiency in determining our positions on this or that issue of modern times. The classroom sessions and assemblies are not effective in this regard.

Propaganda officers must be given more independence today, especially in the choice of class topics within the system of political training. They are largely defined by

the GlavPU [Main Political Directorate] and the Political Directorate of the Air Forces. I would like to say, for the sake of fairness, that it has become better linked with life and the vital issues of modern times. There are nonetheless still such topics as "The Correlation of National and Internationalist Consciousness in the Fight for International Security." Can there really be no more concrete problems in the country or the army that must be investigated, and relations toward which must be devised? We must plan for the training period while indicating no more than 50 percent of the required topics.

Matters also stand poorly with the supply of instructional literature, not to mention its content.

It is time to stop being engaged in self-deception. It is impossible to speak of any qualitative shift in ideological work without highly professional training, a strong (and not primitive) teaching-materials base and an expansion in the independence of the enormous contingent of propaganda officers. Isn't that why many political officers fear meeting with people today, feeling their own incompetent and unarmed nature?

*Major V. Kiyanitsa, propaganda officer of the political department (Kiev Military District)*

### **Follow-Up: "Who is 'Battling' the Guards?"**

A letter was published under that a headline in the September issue of AVIATSIYA I KOSMONAVTIKA from veterans of an aviation unit renowned in battle in the Great Patriotic War and disbanded in connection with the cutbacks in the armed forces.

A reply was received to that appeal from the chief of one of the directorates of the Air Forces Main Staff, Lieutenant-General Aviation N. Guguchkin:

"The letter from the veterans of the Guards Stalingrad-Katovice Red Banner Air Regiment, despite the relative remoteness of the events described, has touched on exceedingly topical issues arising from the performance of organizational measures in the armed forces of the USSR. The resentment and passion of the veterans in connection with the disbanding of the guards regiment, which has traveled such a noteworthy combat path, can be understood in human terms.

"However, the reproaches directed toward the command of the armed forces and the Air Forces for a supposedly poorly thought-out decision that were made in the letter, it seems to me, are more under the influence of feelings than intellect. I am convinced that people so competent and experienced in military matters as the authors of the letter cannot fail to know how carefully each decision on disbanding or reforming military units is prepared. Combat honors, the state of the equipment, the social and domestic conditions of the personnel and many other concrete conditions and features are taken into account therein. Units armed with obsolete aircraft

systems are thus being disbanded first of all. Such was the case with the Stalingrad-Katovice Regiment. There are no evil intentions here.

"As for history, the guards soldiers will not be stricken from it. I assume that the council of veterans of the unit and everyone who passed through the noteworthy school of life and combat mastery there, in the current situation, will be able to find effective forms and methods for propagating the glorious battle deeds of the regiment and educating the young in the traditions of the winged guards."

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### New State Commission to Manage Air Traffic Control

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pp 10-11

[Article by Candidate of Technical Sciences Colonel S. Shumilo and Colonel V. Smirnov under the rubric "ATC: Prospects for Development": "Who Should Be Master of the Sky?"]

[Text] *The state commission USSR Gosaeronavigatsiya [State Commission for the Utilization of Airspace and Air Traffic Control] has been formed by resolution of the Soviet government. It has been charged with forming a unified system for the efficient utilization of airspace and air-traffic control (ATC) in our country. An analogous system had appeared in the United States as early as 1945.*

The safe utilization of the airspace is a complex and integrated concept typified by the state of the system of organization of flight support for aircraft and their control. Such systems have been created in virtually all countries of the world. Every state has selected the path of its development and through mistakes, failures and material expenditures has proceeded toward the achievement of this aim. More than 40 years of such inquiry have passed, which has allowed many countries to move far along in this matter, while others who have neglected this work have become bystanders. The latter unfortunately include the USSR.

We have already become accustomed to the fact that grave air accidents are often the impetus for the solution of urgent problems in aviation. A governmental commission assigned to investigate the causes of an air crash in the area of the city of Yuhnov in 1969, where two aircraft collided in mid air and the members of a USSR all-star parachute team were among the victims, affirmed serious shortcomings in the system of air traffic control, its lack of technical sophistication, and the fragmented and scattered nature of the equipment among various agencies.

The conclusions of the commission were unequivocal and were came down to the necessity of a unified state

agency for the control of flights in the country, which agency would be entrusted with all responsibility for the organization of procedures in the air. These proposals were inherent in the formation of the Unified Air Traffic Control System in the USSR. The ATC bodies of the Ministries of Defense and Civil Aviation became the basis for it. It is currently supervised by a temporary interagency commission that meets twice a year to conduct its work.

The zonal interagency commissions intended to devise measures to organize air traffic control in the zones of responsibility of the Air Forces in the military districts are also temporary. The operational ATC bodies are part of the agencies. That is why the question of who exercises the day-to-day supervision of the "system" is virtually impossible to answer.

This erosion of subordination makes the efficient resolution of questions of mutual utilization of radio equipment by the agencies in essential cases more difficult. The same thing also pertains to the equipment for monitoring the country's airspace. This is leading to an increase in the amount of redundant radio equipment and its inefficient utilization.

The departmental parochialism engenders not only parallelism in the operations of various bodies, but also differences of opinion among them in developing standard documents regulating the rights, responsibilities and procedures in the utilization of the airspace. Whence the coordination of substantiated norms is dragged out for a prolonged period and, ultimately, each side corrects them in favor of "its own" agency. They try to correct unfinished work in the local areas using various instructions, technologies and agreements that it is sometimes difficult even for an experienced specialist to understand.

This situation, in the aggregate with other causes, is leading to dangerous situations in the air, catastrophes, enormous economic losses and, finally, a drop in the prestige of aviation in our country on the world stage. The mid air collision of the Tu-16 and An-24 aircraft around Zavitinsk, the Tu-134 and An-26 in the area of the airfield at Lvov and the An-26 with a mountain range in Alma-Ata, among others, are confirmation of this. On 22 Jul 89 two "Boeings" in the airspace between Leningrad and Tallinn with 700 passengers on board remained whole only by some miracle. The point of intersection of the flight routes of the airliners was at the same altitude at an interval of just a few seconds.

The lack of coordination between the agencies using the airspace and the absence of an effective coordinating agency makes the pursuit of a uniform policy more difficult in equipping the ATC system with electronic gear. Industry is forced to manufacture expensive and virtually one-of-a-kind equipment separately for military and civilian aviation. This leads, along with an increase in spending, toward the poor equipping of each of them with radar, navigation, communications and landing

systems. The level of sufficiency of the "ground" for the USSR MGA [Ministry of Civil Aviation], for example, currently comprises an average of 60 percent of the norm. A governmental program envisages bringing it to 70 percent by 1995, 84 percent by the year 2000 and 100 percent by the year 2005. The existing safety levels of the airspace in the USSR, according to data of the International Civil Aviation Organization (ICAO), is almost half the average level for the ICAO member nations, and only a quarter of the United States.

The government of the USSR, taking the existing situation into account, has decided to form USSR Gosaeronavigatsiya—the State Commission for the Utilization of Airspace and Air Traffic Control—under the USSR Council of Ministers. The foundation has thereby been laid for the formation of a system with important defense and national-economic significance. As the experience of the developed capitalist countries shows, it can bring considerable economic profit to the country under the conditions of cost recovery [*samookupayemost*], including in hard currency. Calculations show that USSR MGA could conserve 15 million tons of aviation fuel a year as the result of the efficient distribution of airspace alone.

It is also obvious, however, that organizational measures to resolve this problem should be buttressed with significant material investments. The upgrading of the ATC system in the United States, for example, will cost 16 billion dollars, according to the estimates of foreign specialists, and will occupy third place in value behind the Apollo program and SDI.

Our newly created organization is being called upon to provide for the direct control of air traffic and its planning, the coordination of the activity of the corresponding ministries, agencies and organizations in the airspace with a regard for the priorities stipulated by the legislation of the USSR, the rational and efficient distribution of the country's airspace in the interests of defense and the national economy and the monitoring of the procedures for its utilization, assistance for the crews of aircraft in trouble or that have suffered a disaster and the economy and regularity of air traffic, among others.

It is widely acknowledged that a main administration answering for overall policy in this realm, planning, personnel supervision and disposal of the budget is essential in the structure of the ATC system. It is obliged to provide for serving all users on the basis of a statewide approach, and should not be subordinate to any agency.

Hopes for the fastest possible achievement of a modern level for utilization of the airspace and air traffic control in the country are linked with the formation of USSR Gosaeronavigatsiya. Based on foreign experience, there is every reason to assume that such a system could be created and function well only with the combined efforts of the bodies of state administration of the USSR and the union republics. The system is planned to be created before 1 Apr 92.

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### Aircraft Repair Facility Details Accomplishments

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[Unattributed article under the rubric "Among the Workers at the Aircraft Repair Enterprises": "A Continuation of Honored Traditions"]

[Text] *These used to be aircraft repair shops. They had 121 people, two lathes, one drill press and five toolbags. The emergence of one of the best plants for the repair of aircraft in the Air Forces started from that production base.*

Its path could be called both a labor and a military one. The aircraft repair plant that is headed today by Colonel I. Pavlov was created in November of 1940, and traversed the difficult roads of the front with honor. That included about ten redeployments at night. During the day they did not stop for a minute in repairing the aircraft. Some 1,120 aircraft of various types were repaired in all over the period of the Great Patriotic War.

The collective of the enterprise, starting in 1952, was one of the first in the Air Forces to begin the assimilation and repair of the MiG-15, Il-28 and MiG-19 jet aircraft and the VK-1A and VK-1F engines.

Much was done for the development and improvement of production at various times by plant supervisors G. Komarov, D. Shilintsev, V. Lazarev and N. Pokrovskiy along with veterans of labor S. Boldov, M. Lebedev, V. Chibisov, V. Zavyalov, P. Malozhen, A. Baykov, V. Taurlin, G. Lobanov, V. Ivlev, I. Bystrov, A. Solodkiy, M. Fateyeva, A. Makhova, P. Pankratov and N. Khromov, among others. One of them is already at well-deserved rest, while the others continue to work.

The plant collective has been repairing supersonic fighters of all types since 1962. More than 1,400 of the MiG-21 alone have been repaired there, as well as more than 4,000 engines.

The enterprise collective is constantly assimilating new technology and new forms and methods of production. Progressive and improved processes for the performance of non-destructive testing, including X-ray, eddy-current and ultrasound methods, plastic reinforcement of parts with tumbler polishing and ultrasound and the counting of engine parameters using computers are all in widespread use.

The plant, as a base enterprise, is engaged in instructional assistance and the transfer of experience to others. This is expressed in the preparation of technological documents and drawings for equipment and tooling and the training of specialists. Close ties have been established with enterprises in the ministries of the aviation

industry and civil aviation, along with scientific institutions around the country. Research is underway on reliability and prolonging the service life of aircraft equipment.

A radical modernization of all shops has been carried out for the purpose of further developing the enterprise. A production wing equipped with test benches for automatic fuel-systems assemblies, an aircraft-repair wing with the installation of jigs, materials-handling machinery and monitoring and test gear, a wing for the finalizing of aircraft, a monitoring and testing station with auxiliary production, and a section for mothballing and packing aircraft engines have all been built and put into service. Much has been done to improve housing conditions for the workers at the plant, and to provide them with every kind of social and domestic services.

The production achievements of the workers, scientific and technical personnel and office personnel of the plant have repeatedly received incentives from the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions, the Ministry of Defense and the Commander-in-Chief of the Air Forces. The enterprise was awarded the Leninist Anniversary Certificate of Honor in 1970 in honor of the 100th anniversary of the birth of V.I. Lenin.

The collective has been awarded the challenge Red Banner of the USSR Ministry of Defense and the Central Committee of the aircraft worker trade union 20 times for good results in All-Union Socialist Competition. A decree of the Presidium of the USSR Supreme Soviet awarded the plant the Order of the Red Banner of Labor in 1986.

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### **ZabVO Flight Safety Chief Criticizes Unnecessary Risk-Taking**

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[Article by Colonel A. Sinevich, combat pilot 1st class and Chief of the Flight Safety Service of the Air Forces in the ZabVO [Transbaykal Military District] under the rubric "Flight Safety: Experience, Analysis, Problems": "The Verge of Recklessness—Or Mistakes That Cost Too Much"]

[Text] Chances in aviation (with the exception, naturally, of pleasure flying) often end tragically. This is an objective reality. That is why careful preparation of both the flight personnel and the aviation and support equipment for the flights is so important. One can find thousands of justifications for miscalculations, errors, poorly thought-out deeds and actions, but it is impossible to consent, one simply cannot consent, to the fact that people can perish or be seriously injured in peacetime. We have nonetheless not yet been able to get rid of accidents.

\* \* \*

The search was dragged out while the terrain was surveyed from the air in several directions. The downed helicopter could have strayed from the assigned path by five, ten or more kilometers. They had to find out the situation with the crew. The uncertainty had given rise to a number of questions. No one could give an unequivocal answer to them, and they probably did not dare. They knew that the helicopter, despite the bad weather, had taken off on an assigned routing, apparently hoping to traverse a difficult sector along a river channel. Communications with them were then cut off.

According to rough estimates, indirect blame for what had happened rested with almost twenty people. Not one of the links in the mechanism supporting the flight of the crew of Captain N. Fadeyev had sounded a definite ban on the takeoff. The events developed along the lines of "Let them fly, then we'll see." Decisions were made, as they say, in an off-hand manner, without regard for the actual weather conditions. Logic and common sense suggested taking some time and not rushing to let the Mi-24 go. Let there be a delay, let something in the plans get moved around, but no one would ultimately lose anything. That is probably how they should have acted, but alas...

The Mi-24, whose crew included, aside from Captain Fadeyev, weapons officer Senior Lieutenant S. Mironenko and flight technician Senior Lieutenant M. Timofeyev, had gotten 32 km [kilometers] off course. They got into a mountain cul-de-sac. The tail rotor hit the top of some trees. And the rotary-wing aircraft lost control...

We will consider several instances from the accident, relying on recordings of radio communications among the crew members.

#### **On communications:**

Crew commander (C): "Negative contact, see, none at all."

Weapons officer (W): "Huh?"

C: "Negative contact."

W: "Oh..."

C: "How come our station is not saying anything, I don't understand."

W: "I don't know."

#### **On how they were flying:**

C: "What heading are we on, cardinal heading?"

W: "Cardinal 90."

C: "It was 60."

W: "Yes, 60..."

C: "We have to turn by 180."

W: "Why 180?"

C: "Because we're off to the north on 60."

W: "To the north?"

**On the weather (after searching for a place to land and when landing):**

C: "Look how tight it's gotten, we'd better 'call' or they'll be worried."

W: "Look, it's snowing, let's wait till it gets better."

**And once again on the weather conditions:**

C: "We're in a snow squall, boys."

W: "Oh."

C: "Look what we've flown into."

W: "That's why it got so tight."

C: "See how the snow is piled up all around."

W: "It's white all around..."

Where is that edge anyway that we some of us, in crossing it, lose control not only of the situation, but ourselves as well? Why do we have to reap bitter fruit in situations when the instinct for self-preservation—the most reliable of the instruments for preserving a person's life—should unflinchingly be triggered?

Psychologists provide hundreds of recommendations on how to behave in these or those instances and develop the corresponding instructions and techniques, while practice brings us "surprises" that are entered right into the book of "sad" records, having already inscribed in it the sentence "Remember: your fate and the fate of those close to you is in your hands, and yours alone!" I am convinced that no appeals or guiding documents will help if circumspection and the mutual responsibility of each and every one are lost. And here it is clearly not an issue of playing it safe—this is another plane now, another subtext to the discussion.

\*\*\*

The transport aircraft was coming in for a landing. After passing the inner beacon, the assistant commander of the craft, Senior Lieutenant V. Buyvidovich reported that he did not see the runway. A difficult situation arose. But here the aircraft commander, Lieutenant-Colonel Ye. Ryzhov, committed an impermissible error. He diverted his attention from piloting to search for the runway, due to which he lessened his monitoring of the descent. He did not react to crew information on the altitude. He made the decision to go around too late. The aircraft landed on the runway at increased vertical velocity and crashed.

This instance was a classic example of a lack of flight discipline. No one was injured thanks only to good fortune. But what if there had been passengers on board? The saddest part is that this flagrant error was committed by an experienced pilot who had flown over 4,000 hours. A deputy regimental commander, who as part of his job was already obliged to cultivate among his subordinates a spirit of unswerving observance of the rules and regulations of flight service, himself transgressed. He has now been removed from flight service.

All kinds of disasters are befalling us all the time lately. Irresponsibility, technological incompetence and operational shoddiness are leading to peoples' deaths and inflicting enormous harm on morale and material. And our carelessness is to blame for everything.

It is difficult even to grasp the nature of it. Is it confidence that tragedy will occur someplace else, ignorance and a reluctance to work according to one's conscience or, perhaps, a simple lack of monitoring? It is just that the blows of fate, as life shows, do not teach us anything. It seems to everyone that disaster will happen somewhere else, and nothing will happen here. While getting angry at somebody's mismanagement or inefficiency, we nonetheless do not lift a finger to instill order in our workplace. We are unshakably convinced, having gotten into a state of complacency, that the bitter cup will pass us by. But no! It turns out that it will not. And in such a way that nothing can be corrected.

No, the landing error I mentioned above was in no way an accident. It was the inexorable result of self-assurance, failure to execute and the intentional ignoring of flight rules and regulations, all of which can be combined under the word "recklessness." And they were engendered by violations in flight training and the conformity of flights to the rules, along with a lack of monitoring. There had already been a serious precursor to a flight accident in the unit, after all, when a flight almost ended tragically due to the incompetence of the crew of Captain D. Chigarin. Only the quick-wittedness and resourcefulness of the senior radio operator saved the situation.

This precursor had occurred, but evidently taught nothing to the other fliers. And that evokes particular alarm. If even the example of our fellow servicemen does not convince us, what can you say about information that comes from higher headquarters? Even though it carefully analyzed all of the preconditions and the circumstances that gave rise to them—where the key-note running throughout is the lack of concern for the state of flight safety—it strangely enough arouses no particular emotions among some pilots and technicians. Isn't that why we so often have to encounter indifference among fliers when it is an issue of scandalous instances of mistakes by flight or engineering and technical personnel? And the information is sometimes simply not passed along. Preventive work is of a non-systematic nature.

Here is what often happens. Effective measures for not permitting the preconditions are undertaken and monitoring is tightened in a regiment for the first time. But a month passes, then another, and soon what goes around comes around. The commanders know about the shortcomings, but they are reconciled to them, justifying their failure to be exacting with the large number of tasks they must perform: too many things to do already, they say, what do I need preventive work for? How many times do we have to see that? And it turns out here like the old Russian saying: "The peasant doesn't cross himself until he hears the thunder."

And more confirmation of that. The commander of an Mi-8 helicopter, military pilot 2nd class Captain G. Rebrov, committed an error in basic flying skills when running through a training assignment. The tail rotor hit the water as a result. The unit commander pointed out gross violations in the technique for performing the flight assignment in the course of the investigation. This was a signal to perform preventive measures with the flight personnel. But there was something else surprising nearby. Combat training continued to be accelerated. And an airborne collision of two helicopters occurred a few weeks later that ended tragically for the crew of Senior Lieutenant V. Smola.

A whole chain of violations was constructed in a careful investigation. The flight leader had acted incompetently, and both the organic flight supervisor and the weather-service specialists demonstrated scandalous negligence. The legal norms for the organization of flight operations were essentially ignored by all officials. And the regimental commander himself, who was absent from the airfield during the flights, was the beginning of the whole block of violations.

Some commanders, trying to perform the missions at any price, transgress flight rules and regulations and send up pilots either unprepared or whose basic flying skills in the types of training have been lost, giving them missions beyond their abilities and not taking the weather conditions into account. Vigilance is lessening among some commanders, they are losing the feeling of reasonable alertness, and moreover many of them are themselves the violators of flight rules and regulations or lose their eyes to violations by subordinates. Instructional "vandalism," formalism and deception also have consequences. How else can you explain, for example, the fact that post-maintenance flight checks in the unit where officer V. Zakriyev serves were planned without a final check of the weather, and a change in the flight shift was planned immediately following?

Just what lessons are needed so as finally to understand that the sky does not forgive mistakes, that recklessness is paid for with too high a price? Is it really necessary to get into a difficult situation oneself, to plumb the depths of misfortune, so as to learn well?

Much could be done on the plane of flight safety, but none of this will have the requisite effect if there is not

professionalism at all levels, from the rank-and-file pilot to the regimental commander. It cannot be permitted that people perish in peacetime, leaving widows and orphans and losing expensive aircraft.

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### Drawbacks in Search-and-Rescue Services

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pp 14-15

[Interview with Senior Lieutenant K. Vitkovskiy, chief of the search service of a unit in the Transcaucasus Military District, by G. Grinkevich: "SOS! Hope... of Rescue?—It Comes to Those Who Are Able to Wait, Fighting for Their Lives, but is Sometimes Late. Why?"]

[Text] *The chief of the search group of one of the units in the Transcaucasus Military District, Senior Lieutenant Konstantin Vitkovskiy, has repeatedly taken part in operations to rescue people. The discussion with him was conceived to be on matters of the search-and-rescue service in military aviation, but the discussion proved to be much broader than that. And that was probably unavoidable. It could not fail to reflect the tragic events that have occurred in the country recently...*

[K. Grinkevich] The earthquake in Armenia occurred on December 7. The planning work of the rescuers officially began on the morning of December 12. Five days after the catastrophe! The residents of surrounding villages were the first ones on the scene of the Ufa railroad tragedy, rather than rescue personnel. In tracing the sad chronicle of disasters and catastrophes, we are becoming more and more convinced of the necessity of creating a reliable system of search-and-rescue services. It cannot be said that there have been no changes in this matter. There have been appreciable ones. But nonetheless... What are the chances of rescue in the event of an aircraft accident, catastrophe or other disaster?

[K. Vitkovskiy] The sad experiences in rescuing the crew of the submarine Komsomolets or the passengers of the steamship Admiral Nakhimov, as well as those who were stricken by the earthquake in Armenia or in train crashes, unfortunately does not inspire optimism. But all of us—do not take this as a justification—should know that in any country, be it the USSR or the United States, where rescue practices are far stronger than ours (and they have professional schools, and 300 fully equipped rescue centers operating without problems), specialists cannot come to your aid immediately. People are on their own for some period of time (ideally half an hour to an hour)—that is, they can count only on their own strength—due to the remoteness of the location of the accident from populated areas and airfields, lack of timely information about a disaster, unfavorable weather conditions, failure of radio communications or for some other reasons. The main thing is not to give in to panic or fear.

This strange tale is told. A pilgrim met the Plague on the road, and asked, "Where are you heading, Plague?" The answer was, "I am going to Baghdad. I want to kill five thousand people there." Some time later they meet again. "What did you deceive me for? You said you would kill five thousand, but fifty thousand people died," the pilgrim reproached him. "You are mistaken. I kept my word, and killed only five thousand; the other forty-five thousand died from fear..."

I agree completely with V. Volovich—the author of the book "One on One With Nature," whom I would recommend that all read—where he says, "A person can and should preserve his life and health under the harshest of physical and geographical conditions, if he knows how to make use of everything that the environment gives him in his own interests." And a knowledge of what it can give, of course, is necessary for this. And remember that in any situation, in any emergency situation, they are searching for you and rushing to aid you.

A paramedic or physician, aside from the two rescuers, is in the group that comes to the scene—we are speaking, of course, of the air-rescue service. We have helicopters and lifting and lowering devices for evacuating people from dry land. We are also ready to drop to the stricken by parachute. We have portable radio transceivers, signaling equipment and the necessary kits for rendering first aid.

Yes, the chances of rescue on dry land are great under favorable weather conditions. But if there are fog, rain or strong winds in the disaster area, one cannot guarantee timely aid, fulfilling the assignment without a parachute special for such work. What year they are promising to provide the rescue service with the necessary quantity of special-purpose parachutes, who knows... Industry cannot set up their production, they tell us, because of the high cost of the material. But what, after all, would seemingly be more dear to the state than the life of its countrymen?!

We have not yet been able to supply the groups with the wet suits so essential to operations in the water. Many helicopters are fitted with technically obsolete LPG-2 and LPG-150 winches that were most likely created not for rescue, but for show. These devices have "seats" that cannot lift an injured or frozen (that is, immobile) person on board. Then you have to grab them directly, but the winches cannot lift two. The helicopters are effectively not equipped with the searchlights so essential for nighttime operations.

I saw how our service should really be equipped at the demonstration exercises of the Caspian Flotilla, where specialists from foreign rescue services were also present. We military rescue personnel were not dressed in orange wet suits, visible for several kilometers at sea, but in green, close to the color of ocean waves, as if they were colored so that you have to look a little longer both for us and for those we find. It is at least a good thing that we were able to borrow some from our friends a week before

the exercises. Finally I saw for real the "rescue scoop" with the aid of which a mannequin was pulled from the water in a matter of seconds. The rescue helicopters of the Transcaucasus Military District Aviation, on duty in coastal regions, are not fitted with these "scoops". So just when will the rescue personnel be provided, for real rather than just talk, with all the necessary matériel (parachutes, wet suits, kit)?

Systematic training of the rescue personnel themselves essentially started just in the fall of 1989—the first official assembly of specialists from the Search-and-Rescue Service (I was also there) was held then in Khabarovsk. True, we were learning using our own, Soviet, experience. I think it would not ruin the state if we invited foreign specialists to the next assemblies. They have long since elevated the rescue service to the ranks of the official and essential (it is more than 100 years old in America, and the rescue personnel frequently have higher education)—so there is something there to copy. I would like to ask the question directly: when will we in the USSR begin the preparation and training of rescue personnel in general—not privately, by districts the way somebody wants and can—but at a specific educational institution, and not in a two- or three-week "gallop 'round Europe," but at least over half a year or a full year, thoroughly, so that demands can then be made of the specialists?

[K. Grinkevich] But does the success in this new cause depend only on the educational level of the rescue personnel and the proper material support? The idea of combining existing groups and contingents of rescue personnel into a unified system of emergency aid for places of accidents, catastrophes etc. is being heard more and more often—and it is understandable. But by whom and how will this system be managed, under whose "flag" will it operate? The "Hope" public/government program has been created in particular to unite teams of professionals in various fields (physicians from Riga, cave specialists from Bashkiria, mountain rescue people from Krasnodar and Moscow, Vladivostok and Armavir rescue personnel). What is your attitude toward "Hope"?

[K. Vitkovskiy] Do we really need to spend more on what we already have? The KOSPAS-SARSAT system, developed by design engineers and scientists in the USSR, the United States, Canada and France, has been adopted and is in operation (at least, the military organizations have become fully involved with them). Several Soviet and American satellites receiving distress signals, and then relaying them to the nearest information receiving station, comprise the foundation of the space search-and-rescue system. The data received from the satellite, after processing, makes it possible to establish the coordinates of the location of an accident with a precision of two-four kilometers, which are then transmitted to the national centers for the system. The information received at the center is immediately reported to the leaders of the search-and-rescue service responsible for aid in the area of the disaster or catastrophe. So if our vessels, trains etc. had emergency communications gear

and were hooked up (!), aid would come from the nearest base location of the rescue service, be it civilian or military.

A state system of interaction with officially recognized rescue detachments and services is needed, with concrete centralized management rather than agency subordination. The rescue of people is a crucial affair that cannot suffer dilettantism. It cannot be founded on bare enthusiasm alone. When I found out that the director of the "Hope" program was a retired captain who had served in the missile troops and as chairman of an MZhK, no desire to support the creation of this program arose.

I agree that an independent information structure is needed—a notification and communications service, whatever you want to call it (but first it is probably necessary to search out the funds to provide not only all aircraft, ships and trains with the radio sets, but also all expeditions and tourist groups). Many people, and even the rescue personnel themselves, would probably not mind having a map of the USSR marked with the base locations of the services, so as to know who to count on in this or that situation.

Civilian information centers are also needed. Or else just try and call to find the necessary person, for example a psychologist, so as to "bring back to life" people who have been rescued from a disaster and are shaken with terror. Why couldn't the civil-defense headquarters take on this information mission?

[K. Grinkevich] But the service is operating despite all of this. What do you, as well as your subordinates, have to be directly occupied with as the chief of the rescue group?

[K. Vitkovskiy] The composition of the group is too small—new staffing levels should be approved very soon. I teach my subordinates how to use the rescue equipment, and conduct training exercises on the terrain using that equipment for search-and-rescue and rendering medical assistance. Once again, parachute jumps (each of us is obliged to perform 100 jumps a year under various weather conditions).

And I am also engaged in housekeeping chores. We built a training area by scrounging (we are getting the materials from Tbilisi and Telavi, at various places in the Transcaucasus) and are fitting out a classroom.

As for abnormal situations... The group had to perform a search for the crew and passengers of an Il-76 military transport that crashed in October of 1989 when delivering airborne servicemen from one of the airfields in the Transcaucasus Military District.

There was unfortunately no one to save—all the people were killed in the explosion of the aircraft. It remained for us only to find the bodies of the victims and direct ships to them, since we ourselves could not lift the bodies out of the water—the breaking strength of the LPG-150 winch boom, 150 kilograms, could not hold two. It is also

good, as blasphemous as it may sound, that the crash occurred along the shoreline and we were able to return all the bodies to their relatives...

[K. Grinkevich] Konstantin, I cannot fail to ask this question. You are serving in one of the country's "hot spots," Baku. Isn't it rather difficult for your service in that atmosphere?

[K. Vitkovskiy] Our service is the search and rescue of people who have suffered misfortune—in places where there is no one to come to help but us. My profession is one of the most humane in the army, as paradoxical as it may be (after all, I have officer's epaulets on my shoulders). The freeing of hostages or the removal of people from encirclement by bandits is not in our "job description."

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### Deficiencies in Aircraft Development Process Explored

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[Article by Candidate of Technical Sciences Colonel A. Stefashin, Deputy Chief of an Air Forces NII [Scientific-Research Institute]: "Ten Thousand Patches, But More Rips"]

[Text] *The wave of glasnost is raising up and, through the mass media, crashing down onto readers in torrents of common sense, conjecture, malice and populist froth. And it is annoying that not all the authors looking into issues of the creation of aircraft burden themselves with objective analysis. The range of assessments here is exceedingly broad—from total sullyng to unqualified praise—accompanying the arrival of our new aircraft at international air shows. Their results make it possible to conclude that the design execution, aerodynamic properties and flight and performance characteristics of our aircraft are not inferior to foreign ones, and in a number of cases are even superior to them.*

There is, at the same time, an area (avionics and computer technology) in which our successes are extremely modest, the state of affairs is known only to specialists and it is not common for the press to extend to this topic. I will not do so either, the more so as the task of my feature is not to evaluate the equipment, but to review the problems in its creation, not relishing the drawbacks, but searching for the causes of their appearance, without determining who is to blame, and seeking ways of improving matters.

I would like to dwell first and foremost on the state of development of aircraft. The following phenomena have been typical over the last decade.

Poor discipline in the execution of plans for the development and testing of new equipment. The quality of

execution of the plans, as well as the experimental prototypes offered for testing, is inadequate. Preliminary design solutions are superficial, many of the assigned characteristics are poorly substantiated and the opportunities for achieving them are proving to be extremely doubtful. The technical look of the item under development at this stage can be discerned only in abstract form, and is often changed later. Commission documents on the preliminary designs abound in lists of drawbacks. The equipment is submitted for testing, as a rule, without being brought up to the needed specifications. Hundreds of flaws and drawbacks are detected as a result, most of which are not eliminated in the course of testing and accompany the prototype into series production and into service with the troops.

In the technological process of the development and testing of new aircraft—cost is no object. The amount of ground preparation is insufficient, and the developer basically strives to perform refinements in flight testing, which is labor-intensive, complex and expensive. And since a multitude of equipment failures also occur therein, the result is frequent idle time and losses of time and material. The issue of an efficient technology for testing that minimizes expenditures does not face the developers. Non-flight test methods are poorly incorporated.

The preliminary specifications for new prototypes are not completely fulfilled, and the use of any sanctions against developers for it is not practiced. Priority is given in the creation of aircraft to directed deadlines for its manufacture over its quality, and the dictate of the contractor over the customer is manifested in decision-making. The physical plant for testing lags the level of sophistication of the items themselves being tested, thereby not providing the needed quality under the actual conditions of combat application.

We will consider the basic causes for the negative phenomena listed above. It should be stated first and foremost that the technology and quality of military hardware is inseparably linked with the scientific and production potential of the country. The significant successes of military technology are also explained by the fact that its development proceeded under great administrative pressure and with fewer financial and resource restrictions. The further development of defense production is being restrained to a significant extent by the prevailing system for managing the process of creating military hardware and imperfections in the existing relations among its participants. I do not join in the assertion of the former military test pilot A. Akimenkov (AVIATSIYA I KOSMONAVTIKA, 1990, No. 7) that the root of evil should be sought in abuse and corruption within the military-industrial complex, that is, in individuals. That would be easy to rectify with the aid of law-enforcement bodies. The objective reason is concealed in the fact that the existing procedure for organizing the development and manufacture of new hardware has eroded responsibility for its creation and engendered a lack of personal responsibility. We must

consider the whole production process, as they say, in order to become convinced of this.

The creation of a new object began, as a rule, with a decree of the CPSU Central Committee and USSR Council of Ministers. That document opened up the financing and supplied the resources but, at the same time, signified that the higher authorities would bear responsibility for equipping the armed forces themselves. The guiding documents required coordination of the specifications at the stage of the issue of those specifications to the general designer. Here is where the flaws of the administrative-command system made themselves fully felt—universal employment at firms at minimal productivity (“I have a lot of work”), a lack of vested interest in high labor quality (“we can’t do that”), a monopoly position and lack of competitors (“if you don’t agree with my terms, find another general designer”) and other arguments. There are no mechanisms that would stimulate him to the achievement of the most he could do. That being so, he took on the work he could perform using today’s—and even yesterday’s—technology. Right there was the birth of the lag. The characteristics the customer wanted are reduced after prolonged arguments (there is nowhere else to go), the specifications are coordinated, but responsibility for the future is shared by two: one (the customer) wanted more, but the second (the general designer) does not agree, while the second could perhaps have done it, but he signed what was left after the arguments.

The process of developing aircraft in no way differs from the corresponding processes at any other of our enterprises: everybody is employed, earnings are guaranteed, productivity is minimal, the movement of orders is slow, whence they pile up, and there is evidence of a large quantity of work (overloading). They report to the higher-ups the fulfillment of the work by the deadlines, but not in quality. The quality is thus poor, especially at the stage of preliminary design engineering. And what if suddenly things did not work out with the deadline? Unpleasant, perhaps, but not fatal. They will have to manage without fanfare. They will have to go to the ministry or to the military-industrial commission and get the deadline changed. And they are not even deprived of bonuses. A new decision signed by the ministers (a collective body) will be prepared. And when it is collective, responsibility is divided, that is, there isn’t any.

Here is where a most important paradox arises: the customer made the order, but the ministers supervise its fulfillment. Why? Because they pay their own enterprises the money for the work. And if normal logic suggests that this should be done by whoever calls for the music, here it is the opposite. Whence the customer can have virtually no influence on the course of fulfillment of his own assignment. He does not feel himself responsible for its condition as a result, while the developer is covered by the collective decisions.

The customer's commission, in accepting the preliminary design, is constantly resolving one and the same problem: accept it or not? Conscience does not allow it to be accepted—the work is poorly done. Not accept it? The administrative system then comes out fully armed—you don't like it that everything is not in order with reliability in the design? We have a decision that obligates us to do that next year. Efficiency? We have a decision that...

The customer's commission is surrounded, it begins to understand that everything has already been decided without it, its role is just a formality. And if it makes a "stand," nothing will change, the money is paid by the ministry, not the customer, anyway. There are thus always clear skies over the contractor, neither competitors nor the risk of material losses chase him, and there is no need to exert oneself.

The general designer in turn experiences the problem of managing the workers of allied industries. He is called the general designer, but the control over them is located at their ministries. Management thus once again proceeds through administrative pressure and collective decisions.

The directive deadline for the start of flight testing draws closer. The workers in allied enterprises are at varying degrees of readiness, the ground testing has not been completed, the on-board systems have not been installed. The general designer faces the alternatives: either wait for complete readiness, or start testing with what there is. As a rule, he chooses the latter. He decides to make the first flights, reports on the start as planned in the stipulated (or adjusted) time period, and then the testing process is either halted for a long time or the tortuous and expensive refinement of the systems that have not been developed properly on the ground begins.

With the transition to state testing, the general designer inevitably runs into the testing organization of the customer, which has always adhered to the normal logic that an aircraft that has been brought up to the assigned requirements should be submitted to the "state men." But there are already collective decisions against this logic. You don't want to start testing because the wrong set is on the aircraft—that is the decision of the ministry; the parameters do not conform—here is the decision of the military-industrial commission; something else—there will be a corresponding decision. If some system cannot be evaluated at all—no problem, that is a question of special testing, which we will conduct after the state testing. Let there be 10 or 20—it is not important, the main thing is to start at the stipulated time.

The testers are surrounded. They are beginning to understand that everything has been decided without them once again, that the ministers know better when to start testing and how to conduct it, while they, the cogs, should dance to the music of the high decisions. They begin to test an aircraft that no one has actually ordered.

This is the system under which we have been creating the aircraft we are equipped with today.

A key question arises—who personally answers for the state of the equipment? Why, nobody. It was created "by everybody," on the basis of collective decisions. Proceeding from that, you do not seek out those to blame. But in the event of confusion, proceeding then from the concept that someone should be to blame, they would, of course, find him, and not necessarily among those who actually supervised the creation of the new hardware. The lack of personal responsibility in the system thus engenders arbitrariness.

The system for managing the development of the testing base, which exists thanks to the whatever's-left-over principle, is closely intertwined with this system. The formula "the main thing is to make the airframe, how it is tested is a trifle" is tacitly realized. The testing equipment lags behind the technical level of the new aircraft and armaments being tested as a result. That is why it is difficult to say, even after testing, how the new craft will behave in an actual battle. The final decision about how and with what to equip the testing center should clearly be made by those who have a vested interest in it, that is the tester, rather than an official from the administration, who does not know the essence of the problems that are being faced.

The existing system for managing the creation of new hardware naturally did not and does not contain incentives either for high quality or for reductions in time or expenditures. Administrative efforts were aimed principally at "catching up." The general outlines of how to rectify this situation are clear today. The basic guidelines for the restructuring can be reduced to the following.

Realize the principle of personal responsibility for the creation of military hardware. Those who will be using it, that is the branch of the armed forces in the person of the commander-in-chief, should thus order it. He substantiates the prospects for its development, works out an arms program, requests the necessary funds, places orders for experimental and series-production equipment on the basis of direct negotiations with the lead contractors, finances them and monitors the fulfillment of the orders. All decisions regarding the management of the course of development are made only by the customer and the developer on the basis of a contract. Interference in their activities by various authorities should be ruled out. Then only the customer answers for the hardware that he ordered and accepted. A distribution of responsibility is realized—the developer answers to the customer, and the customer to the people (the government).

The role of the ministries and agencies on this issue should be reduced to logistical support, the organization and financing of research on the prospects for the development of the sector and the creation of scientific and technical projects underway. Competition in the development of new hardware is essential.

All of these ideas have already seized the minds of specialists. Many of them have not only been declared, but incorporated as well. But this is still not having any effect on the relations of the participants in the process of creating the hardware and its results. All of the flaws in the system are still alive, and the military-industrial commission continues to make decisions on how to conduct testing through the present day. And the military wait for the day when they can get what they ordered, and not what they are given...

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### **"Albatross" Search-and-Rescue Seaplane Described**

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[Article by Colonel V. Bezborodov under the rubric "Soviet Aircraft": "The 'Albatross' Comes to the Rescue"]

[Text] When Il-38 aircraft appeared over the submarine Komsomolets in the Norwegian Sea three and a half hours after the fire had started on it, it was still afloat. If only they had been able to land alongside and take people on board, warm them up and give first aid! But the aircraft were not adapted for that. All their crews could do was drop aerial rescue pods and lead ships to the boat. The frozen and exhausted sailors could not use the pods. Forty-two of the 69 crew members perished.

The Albatross, a flying boat that has been specially designed for the performance of search-and-rescue operations in the open sea, was "late" to the scene of the catastrophe... by several years. It could have appeared sooner, but the leaders of the country and the industry sharply cut back the financing for work on improving seaplanes in the 1970s, leading to a decline in the pace of design engineering and development of new aircraft.

But the hope lived among aircraft designers that the decision to create a large seaplane, the need for which had been firmly established, would be made. They were not only hoping, but also working. The scientists, designers and industrial engineers of the Taganrog Aviation Scientific-Technical Complex imeni G.M. Beriyev, in conjunction with specialists from TsAGI [Central Institute of Aerohydrodynamics imeni N.Ye. Zhukovskiy], VIAM [All-Union Scientific-Research Institute of Aviation Materials], TsIAM [Central Scientific-Research Institute of Aircraft Engines imeni P.I. Baranov], NIAT [Scientific-Research Institute of Aviation Technology], LII [Flight Research Institute] and other scientific-research institutions solved such problems as ensuring a combination of durability of design of a future seaplane with high aerodynamic refinement, the protection of materials against the effects of sea water and the operational stability of the power plant in all modes. More than 50 major domestic and foreign inventions were incorporated in creating the aircraft, and

progressive concepts and advanced engineering solutions were realized in seaplane building. A variable keel-shaped bottom was designed for the first time in world practice, making it possible to improve considerably the steadiness and controllability of the aircraft in movement on the water, as well as to reduce the load factors in takeoff and landing on water.

The Komsomolets tragedy showed that there could be no more delay in the building of highly effective means of rescue. Additional financing helped speed up the work, and confidence now exists that the Albatross will soon be appearing in the air. Its prototype—the A-40 aircraft—is already undergoing flight testing, in the course of which a crew commanded by B. Lisak with navigator M. Andreyev, flight engineer V. Cherbanov, radio operator L. Tverdokhlebov and operator A. Sokolov established some lofty achievements in the amphibious-aircraft and seaplane class: lifting a cargo of five tons to an altitude of 13,300 meters, and 10 tons to 13,100 meters. The aircraft, in the opinion of the testers, is easy to control, the flight and navigational equipment is convenient and the flight deck is spacious and has good visibility, which is of no small importance when performing search-and-rescue missions.

The Albatross is a cantilever monoplane with a high-set swept wing and a T-shaped empennage. Two turbojet bypass engines are mounted over the wing, keeping them out of the water on takeoff and landing. The length of the aircraft is 42 meters, the height 11 and the wingspan 42. The aircraft can operate from airfields with a runway not less than 1,800 meters long, as well as from internal bodies of water and the seas with a wave height of up to two meters.

Hundreds of glued structural elements and non-metallic materials are widely employed in the airframe of the plane, used for the first time by the OKB [Experimental Design Bureau] imeni G.M. Beriyev in creating the Be-30 passenger aircraft, whose design and technology of manufacture provided a significant impetus for the development of Soviet aircraft engineering. The mass of the empty aircraft to the full takeoff weight, despite the necessity of providing for the seaworthy qualities and additional strength, is commensurate with the analogous indicators for purely ground-based aircraft as the result of this treatment.

The aircraft has a comparatively high patrolling speed in searching (320-400 km/hr) and, at the same time, a quite high cruising speed (up to 800 km/hr), making it possible to arrive at the scene of a disaster quickly. The Albatross can take on up to 60 people. It is proposed that it have four or five rescue specialists on board who would, after the aircraft has landed and is approaching from the downwind side to the stricken at the minimally allowable distance, conduct the rescue operations using LPS-6 boats and surface watercraft.

Physicians—a surgeon, therapist and anesthesiologist, as well as a surgical paramedic and paramedic—are part of

the medical team that can bring people out of hypothermia or shock, and give first aid. They have surgical, automatic operative and intensive medical monitoring gear at their disposal, transfusion apparatus for direct intravenous blood transfusions, apparatus for the inhalation of anesthesia and artificial ventilation of the lungs, an electro-cardiograph, a paramedical doctor's kit, a set of burn medicines, an antishock kit, bags, life jackets, coverall suits for heating the stricken, litters, warm suits, footwear and other medical equipment and implements.

The development of amphibious aircraft intended for fighting forest fires, as well as passenger and cargo versions, based on the Albatross is underway.

The fire-fighting aircraft will be able to deliver parachutists and cargo to a disaster area, as well as drop up to 25 tons of water at an average concentration of 2.3 l/m<sup>2</sup> of the ground at a speed of 230 km/hr at the leading edge of a burning forest. The drawing of water on board is planned to be accomplished through special collectors in the bottom while gliding between landing and takeoff, which will make it possible to increase sharply the number of sorties to the seat of the fire, thereby raising the effectiveness of the fire-fighting. The necessary length of the body of water is 3,200 meters, and the duration of patrol flying is nine hours. The aircraft will be able to transport 95-100 passengers in its passenger version, or 37 people and 6.5 tons of cargo in the freight version, a distance of 5,000 kilometers.

Many requests are coming in from foreign countries for the versions of the aircraft currently under development, which are superior to world models in many parameters, and if our aircraft builders are able to assimilate series production before their competitors it will be possible to obtain no small amount of profits in hard currency. These funds could be directed toward the development of the national economy, expansion of the network of air connections, first and foremost in the eastern part of the country, with the aid of seaplanes, as well as to equip the Unified Aerial Search-and-Rescue Service of the USSR with highly effective special-purpose equipment—something that it badly needs, in the opinion of its chief, Lieutenant-General of Aviation D. Demyanenko.

But they must hurry. We could lose a great deal, as has unfortunately already happened more than once, if we do not invest enough funds in finalizing the Albatross and organizing its series production. The world market is dynamic, and every year of delay costs us larger losses.

The aircraft builders are already thinking about the further development of seaplanes. The TANTK imeni G.M. Beriyeve is creating, aside from the Albatross, the A-200 multipurpose amphibious aircraft with a takeoff weight of 36 tons. It is planned to be used in island or coastal zones, small internal bodies of water, fighting forest fires, passenger, cargo and ambulance deliveries, patrolling the 200-mile economic zone, supporting geological parties and expeditions, offshore drilling platforms and for field and arctic reconnaissance... The

opportunity of creating a multi-ton aircraft with a liftoff weight of 200-600 tons or more for use in virtually any part of the world's oceans, as well as supersonic seaplanes, is being studied.

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### Ufa School for Helicopter Pilots Operating Successfully

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p 22

[Article by Colonel V. Borisenko, Chief of Staff of the Ufa VVAUL [Higher Military Aviation School for Pilots]: "Your Takeoff Provided by the Ufa VVAUL"]

[Text] Have you ever had occasion to see the appearances of the masters of helicoptering at air festivals or competitions? If not, I can assure you that you have missed a great deal. Only there can young people seeking their way into aviation see, and evaluate according to their merits, the rich aerobatic skills and technical capabilities of the rotary-winged craft and be enamored of them forever.

The helicopter, thanks to its ability to take off and land vertically and to hover in the air, is sometimes an irreplaceable means of transport for the delivery of an assault and military hardware, a terrible weapon in battle with enemy tanks, an airborne scout, a rescuer, ambulance, heavy-lift crane... And, as life has shown, a helicopter pilot should know them all. The road to flight and combat mastery begins at the service schools.

One of them is the Ufa Higher Military Aviation School for Pilots. This is the newest of the Air Forces training establishments. It was created in 1985 and trains flight personnel for helicopter units and subunits of the Air Forces. Many of its graduates, however, complete service in the border troops or the Navy.

The cadets, over the course of their training, receive a profound knowledge of general scientific disciplines—higher mathematics, physics and theoretical mechanics, among others. They study practical aerodynamics, radioelectronics and computer technology in order to master the latest equipment, which embodies all of the advanced achievements of science and production, and become deeply interested in the design and operational rules of aircraft and aircraft engines, radio equipment, instruments, special equipment and aerial weaponry.

The cadets work at training benches and perform exercises in simulators in order to consolidate and develop their skills in managing individual systems and the aircraft in general. They first learn how to operate the aircraft and on-board equipment, as well as make use of ground-support equipment, in a training department, and then during practice flying. Painstaking joint work with flight instructors in training for flights on the

ground and the performance of exercises in the air, practicing each element of the assignment, precedes solo flight by the future officers.

The instructors, among whom are 19 candidates of sciences, the commanders of the training subunits and the flight instructors at the Ufa Higher Aviation School are officers with a great deal of experience in training flight personnel for army aviation, former leading specialists of the line units of the Air Forces who took part in combat operations as part of the Limited Contingent of Soviet Troops in the Republic of Afghanistan, eliminating the consequences of the accident at Chernobyl, the earthquake in Armenia and other natural disasters, accidents and catastrophes. We have people to learn from and to take as a model here.

The day of the first solo flight is unforgettable! It will always remain a great and joyous holiday in the memory of the pilot. And it really is an enormous event when a person—a ground being—gets a ticket to the skies. The cadets at the Ufa VVAUL currently fly Mi-2 and Mi-8 helicopters. Conversion to more modern Mi-38 rotary-winged craft is envisioned in the future.

One of the most important conditions for successful flight activity and professional reliability is the physical and psychological tempering of the fliers. We have modern classrooms, labs, simulators and sports facilities for successful training and independent work. Much attention is devoted to the computerization of training. The school has potential opportunities for the further development and improvement of the physical plant. This means that today's and future cadets can employ their abilities and inclinations toward military-scientific activity or technical creativity here.

I would like to remind you that the cadets are planning on active military service and are provided with all types of allowances. They are given two-week vacations in the wintertime every year, and a month of leave with free passage upon completion of the academic year. The training time is counted toward the total service time in the armed forces. The training period at the Ufa VVAUL is four years. Those graduated from the school are awarded the military rank of lieutenant, and are issued their badge and nationwide diploma with the conferment of the title of flight engineer.

Our school is located in the capital of Bashkiria, between the Ufa and Bela (Agideli) rivers. The city is rich in revolutionary and labor traditions. Ufa is today a city of science and a city of heroic labor. There are many scientific-research institutions and organizations here, along with a state university, institutes for the arts, aviation, petroleum, agriculture, medicine, pedagogy and engineering. There are theaters, clubs, movie theaters and a circus.

Creative and business contacts among the cadets and the city's youth are constantly expanding. Joint mass cultural functions, meetings with leaders in production, trips to museums and plants, sports competitions—this

is a far from complete listing of what spiritually enriches and nurtures the cadets and in fact reinforces the ties between the army and the people.

The program for the restructuring and further development of the Air Forces for the next few years, connected with realizing the principles of defensive doctrine and the concepts of the priority of parameters of quality in the organizational development of the armed forces, devotes a great deal of attention to army aviation. It may be said, taking that into account, that the history of the Ufa VVAUL has only begun. And if the youth who dream of the skies and flight want to make their mark on the history of the school and the Air Forces through excellent training and subsequent conscientious service—come to us.

Address of the academy: 450017, Bashkir ASSR, city of Ufa, 17, Ufa VVAUL.

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### Computer-Based Adaptive Systems Improve Training

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[Article by Colonels V. Pakhomov and Yu. Fomenko under the rubric "Military Reform and Higher Educational Institutions": "Adaptive Training Programs"]

[Text] The necessity of the high-quality assimilation of more and more complex aviation systems, rapid growth in the amount of information and the drop in the competence of specialists against that background requires further improvements in the principal components of the training system—organization, content, techniques.

Existing curricula and programs with fixed times of study and strictly regulated types of classes, by virtue of their orientation toward students with average capabilities, limit the individualization of the teaching process and impede the development of higher schooling. The prevailing system of issuing fragmented, heterogeneous "scraps" of information to students does not facilitate the development of the intellect at a higher level and the formation of an ability to make decisions in complicated situations.

Attempts to get out of this dead-end situation via the incorporation of advanced teaching techniques and other methods of gradual, evolutionary changes, in our opinion, will not bring radical change in the next few years, since the system of higher education has reached its pinnacle and has become quite fixed.

This system can be radically improved, according to data from the developed countries, only through a conversion to adaptive training programs. They are developed for

each student with a regard for his preparation and abilities, and are gradually modified depending on the successes he achieves.

What do we get from adaptive programs? Instruction employing them becomes more interesting, creative and efficient. They foster the development of the personality of the student and his leadership qualities. The degree of their effectiveness, however, is determined by the principles and variations used in structuring them.

The simplest version of adaptive programs is widely used in the United States, in which, for example, the student independently selects two of six disciplines being studied at the same time—from profound or average programs or with the minimally essential amount of knowledge. This approach makes it possible to take into account the abilities and inclinations of the students at higher educational institutions and provides for an increase in their preparation, but it does not make any turnaround in the system of teaching, since it bears elements of the conservative nature of traditional programs.

The most complex and promising versions of the program were developed by A. Saeki and H. Sujuki at Tokyo University based on expert teaching systems. They envisage obtaining results that are not programmed by man ahead of time. They have a striking impact—not only fundamental knowledge is mastered in the process of heuristic teaching, but unknown facts can often be discovered or new information obtained as well.

One of the specific features of adaptive programs is the possibility of flexible variation of such basic parameters of traditional teaching as content and time. If that is all we have in mind, three variations could be realized in the next few years provided the corresponding interest exists: disciplines that have a relatively stable content, where the time for studying them is determined depending on the individual abilities of the students; the time for study is clearly defined, and the content is determined individually for each student; and, part of the discipline is studied according to the first variation, and another according to the second, depending on their specific nature.

The solution of the following problems is required for conversion to adaptive programs of any type: equip the educational institutions with computers and teach the instructor staff how to operate them; perform a restructuring of the curriculum material at the inter-disciplinary and inter-departmental levels, as a rule according to the types of training; convert to a theory of teaching that provides for individualization and computerization of the teaching process; and, create computer teaching systems.

The first problem is in the stage of being solved, although the preparation of instructors is figured more and more for only traditional types of teaching, while the computers arriving at the educational institutions have limited capabilities.

Work on solving the second problem is also underway. The Ufa VVAUL [Higher Military Aviation School for Pilots], for example, has developed a technology for systematizing and structuring teaching materials. The corresponding program of tactical flight training for cadets at the inter-departmental level has been developed on the basis of it. The development of a modular organization for the teaching process is underway at the Air Force Academy imeni Yu.A. Gagarin. The further development of a system of education entailing a transition to efficient approaches in training is impossible without such a preliminary stage, the same way as individualization and computerization are impossible without their assimilation. Of the greatest interest are the theories of neobehaviorism and the gradual formulation of mental processes of Halperin and AST (Anderson J.R., *The Architecture of Cognition*. Cambridge, 1983). Not one of these can be used in "pure form," especially for the training of the pilot as a broad specialist combining the qualities of a commander/organizer, operator of an aircraft and educator. It is thus expedient to made ideas and elements of various theories inherent in the development of adaptive programs.

The management of teaching should be altered at the same time. It depends in turn on the content of the theory chosen. The mechanisms of eliminating excess information, altering information in the declarative and procedural stages and composing and summarizing knowledge, as well as other mechanisms that allow the efficient management of the teaching process, for example, are inherent in AST.

The computer systems can be of varying degrees of complexity depending on the teaching theory adopted, the capabilities of the base computers and the qualifications of the instructors. Work on creating these systems has already begun at some of the civilian higher educational institutions in our country.

While the first two problems can thus basically be solved in the near future, the realization of the third, as well as the fourth, is labor-intensive, and requires a unification of efforts among all of the higher educational institutions of the Air Forces and the creation of temporary scientific collectives.

Great hopes in the implementation of these issues were entrusted to the practical-science conference of the higher educational institutions of the Air Forces that was held in July of 1990 at the VVA imeni Yu.A. Gagarin. It had as its aim determining ways of improving the training of contemporary aviation cadres, and reflecting those ways in new curricula and programs.

These expectations, however, were not fated to come true. The impression is being created that its execution, as in the old days, was necessary just as a formality. The idea of creating an instructional council for the higher educational institutions that would become the coordinator in resolving these cardinal issues arising before the educational institutions of the Air Forces is also hanging

in midair. They have now accumulated an enormous amount of intellectual potential. It is ready for self-realization. But a sponsor is needed. Will we really have to wait for his appearance from abroad?

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### Officer Argues Against Depolitization of Armed Forces

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[Article by Lieutenant-Colonel V. Pozdeyev, a senior instructor in the Political Directorate of the Air Forces, under the rubric "The 28th CPSU Congress: Problems and Solutions": "Display Wisdom in Creation"]

[Text] *The question of the depolitization of the armed forces is serving as grounds for sharp disputes among representatives of various parties and social-political movements to this day. The insistent demand to eliminate the system of political leadership of the army and chase out the political bodies clearly reflects the aspiration of certain forces in our society to play the "military card" once again. And it is moreover being done in a variation traditional to ancient Rus, throwing the boyar from the beautiful porch to the infuriated mob to calm it. The insolency of the slogan of depolitization for many people, not only the military, is becoming more and more obvious at the same time.*

The 28th CPSU Congress, as is well known, came out against the demands for depolitization and departization of the army. Its stance was formulated in quite well-reasoned fashion in the resolution "Basic Guidelines for Contemporary Party Military Policy." Since there is no sense in reproducing the illusory, contradictory and untimely nature of the whole chain of arguments of the slogan of depolitization, I would nonetheless like to direct the attention of the readers to the basic theme of the differences—the possibility of the functioning of the armed forces without political officers. It was namely to them that the producers of the sharp show under the name of the "Struggle for Power" assigned the role of sacrifice—that same boyar... The demand for depolitization, after all, if we sweep aside the veneer of meeting talk, is basically reduced to the dissolution of party bodies.

Why such extremes? In practice, after all, it will inevitably entail the curtailment of indoctrination work with the personnel, and in the larger sense, a weakening of the moral potential of the armed forces and the destruction of the internal unity and cohesiveness of the soldiers' collectives. It must also be noted that political organizations perform important consolidatory functions under the conditions of the widespread politization of society. Their chief concerns in the armed forces, for instance, were and remain the cohesion and mobilization of fliers for the successful fulfillment of their missions in combat training, improvements in flying skills and the rapid

mastery of modern aircraft systems. The role and place of political officers in this matter, taking into account their experience in educational activity, are undoubtedly the leading ones.

The delegates to the party congress, however, do not deny the necessity of a radical restructuring of the system of political leadership for the armed forces, including cardinal changes in its structure, elaboration of functions and transition to new principles in mutual relations with party organizations...

These and other major changes are not so far off now. Preparations for the start of radical reform in the political bodies of the armed forces, including the Air Forces, is coming to a close. It could be said that the decisions of the 28th CPSU Congress on this issue and the requirements of the Decree of the President of the USSR of 3 Sep 90 are embodied in the concepts of the impending reforms and the new Statute on Political Bodies and their organizational structure.

It is clear that this course of events suits far from everyone. And the heat of passions surrounding the slogan of depolitization will scarcely abate in the near future. The struggle for influence on the army is sharpening, and sometimes taking on uncivilized forms. Let us remember, taking that into account, that the main thing in the serious disputes and debates should always be weighty arguments rather than emotion.

I would like to talk some, from this standpoint and relying on the facts of history and the present day, about why the existence of political bodies in our army is an objective necessity, what the reasons are for the criticism directed at them and ways of assimilating the new approaches to political and party work in the ranks.

So then, the first argument. Political officers in our army appeared in the summer of 1918, first among the troops of the Eastern Front, and then others. The 8th Party Congress, held in March of 1919, adopted a resolution to create a political department of the Military Revolutionary Council on the suggestion of V.I. Lenin. One cannot fail to take into account the conclusions that were drawn by Lenin on the basis of an analysis of the practical activity of political officers among the troops: "Follow the political officer...", "Do not lessen political work," "Where discipline in the firmest of all, where political work among the troops is conducted with the most concern, there is no laxity in the army, its fitness and its spirit is better, there are more victories there."

The connection of political officers with successes in accomplishing combat missions is inexorable. M. Frunze, whose military experience can scarcely be called into question even in our super-critical times, noted that "Who was instilling the elements of order and discipline into the ranks of our young Red regiments, created under the thunder of cannon blasts? Who, during the hours of failure and defeat, maintained the courage and good spirits and infused new energy into their staggering ranks? Who set up the rear areas of the army, planted

Soviet power there and created soviet order, thereby ensuring the rapid and successful advance of our armies? Who demoralized the ranks of the enemy, disrupted his rear areas and thereby prepared smashing successes with their persistent and dogged work? This was all done by the political officers of the army, and it was done, it must be said, in brilliant fashion."

The second argument. The role of political officers was manifested in all of its fullness in the years of the Great Patriotic War. They performed multifaceted work to mobilize the personnel of the Soviet Army for the rout of the fascist usurpers, cultivated courage and heroism, patriotism, hatred of the enemy and faith in victory among the soldiers. The political officers, not by talk but by personal example and soldierly valor, inspired the soldiers to the achievement of the greatest heights of the human spirit.

The third argument. There were periods in the history of our armed forces when the idea of abolishing the political bodies and the institution of political officers was not only cultivated, but attempts were even undertaken for its practical implementation. That is what happened, for example, in 1955. But life itself forced the rejection of that innovation literally within two or three years. Some 84 political bodies were restored in the army and navy in 1957-58, and another 150 political bodies were created. This poorly thought-out excessive reformism led—veterans know this by more than hearsay alone—to much material and moral loss.

History has thus confirmed the vitality of political bodies, although that in no way gives us the right to idealize their activity or not to see the mistakes—and sometimes serious deformations—in them. That is on the one hand. It also forces us, on the other hand, to speak at the top of our voices about the reasons that are impelling people to demand the abolition of the political bodies.

One of those reasons is poor effectiveness, activity by a number of political officers not fully meeting the aspirations of the soldiers. People are making fair complaints against those political departments that do not live by their interests, and push for the resolution of contrived tasks. Soldiers, warrant officers and officers cited this reason most often in the course of sociological research, and it is among the top ones.

There were also serious drawbacks in the style of the activity and the social stance of these or those specific political officers. First and foremost in the style of activity of the chiefs of the political bodies, with which the work of the whole political department is sometimes equated. This cause is connected with omissions in selection, placement and education of key personnel among the political groups.

The negative attitude of a certain portion of the people toward political-indoctrination work as such has also had a negative effect. The decline in the party's reputation among the masses during the period of stagnation

formed among them a subjective disposition toward negating the political officers in the army as the bearers of its policies among the servicemen.

Sociological research shows that it is namely the reasons cited above in the mass consciousness that cause the greatest lack of acceptance of the system of party-political support that existed before, but they are, at the same time, insufficient to conclude unequivocally that the political bodies must be dissolved.

One cannot fail to agree with the argument that there should not be poorly operating political bodies or careless political officers in the Air Forces. In critically interpreting their activity, it is important, at the same time, not to "throw the baby out with the bathwater." Military practice shows that efficiently functioning social institutions find complete support among the servicemen. We should thus not consider the problem of improving the activity of ineffectively functioning political bodies and their social status in concert with the question of the necessity of the existence of the institution of political leadership for the armed forces altogether in equivalent fashion.

People ill-disposed toward the army are propagating the idea that the apparatus of the political bodies has ballooned excessively and requires considerable funds for its upkeep, that practically one out of every four officers in our army is a political officer. The statistics say otherwise: they comprise 2.2 percent of the overall number of personnel and eight percent of officers. They are 1.4 and 5.7 percent in the Air Forces. They are 5.9 percent among pilots. The percentage of individuals performing analogous functions in the U.S. Army, by way of comparison, is 2.8 and 8.1 respectively.

It is also necessary to take into account that the political composition of our armed forces themselves includes not only the officers of the political bodies and the deputies for political affairs of the subunits and units, but also the journalists of the central, district, army and divisional presses (2.1 percent), the workers of institutions of cultural enlightenment (6.6 percent) and instructors from the social-sciences departments of the higher educational institutions of the USSR Ministry of Defense (5.1 percent). Just 16.3 percent of the officers in the political corps are working in intrinsically political bodies.

All political bodies and political officers are incorrectly measured by the same standards. They are different and are accomplishing largely specific tasks. They are united, at the same time, not only by a concern for political teaching and the indoctrination of the soldiers, but first and foremost by a responsibility for the combat readiness of units and formations and for the defensive might of the country. It is namely for that reason that political officers are officers able to command units and subunits and resolve difficult issues of combat training. All the graduates of the political service schools complete a

training course that allows them to master the corresponding knowledge and skills. The graduates of the Military Political Academy imeni V.I. Lenin could in principle replace a regimental commander. Each, in short, has his place on the fighting team.

This method of training the cadres for the political corps has justified itself. It is no accident that many political officers became commanders when it was necessary during the years of the Great Patriotic War. The report of the chief of the cadres department of the Main Political Directorate of the RKKA [Workers' and Peasants' Red Army] to the chief of the Main Political Directorate of the RKKA on 1 Sep 43, for example, said that "In execution of the decree of the State Committee for Defense of the Soviet Union of 24 May 43 and in accordance with the plan approved by you, 119,000 political officers were required to be transferred to command work. Some 130,297 were actually transferred..."

Some 96.9 percent of the political officers, who are supposed to perform the whole set of combat tasks to the full extent, currently hold proficiency ratings. Virtually all the commanders of the political departments and deputy commanders of the air regiments for political affairs have proficiency ratings. The deputy political officers of the air squadrons are 98.2 percent 1st- and 2nd-class pilots.

A considerable portion of the officers in the overall structure of the cadres in the political corps directly perform tasks of combat duty in shifts, gun teams or crews. The contemporary political officer, in short, must be seen not only as a representative of the political apparatus, but also as an officer accomplishing the whole set of tasks reinforcing the defense of the country. This fact, unfortunately for many of those who are insisting on abolishing the institution of political officers, often remains outside the field of view.

There is, finally, one more argument. Today, perhaps as never before, one cannot fail to remember that the political bodies are one of the essential links in the political system of our society. Before shouting "Down with them!" it is very important to weigh, clarify and try to understand differing points of view. Understand so as to create, rather than destroy. One cannot fail to recall here the well-known tale of the tower of Babel, which people were unable to build because they could not find a common language.

It is also important to get a fix in relation to the so-called "deparitization" of the army. It is possible that we will come someday to the fact that the expanded parliamentary multi-party system really will embrace all of society and the army. What will be the dynamic of development of that process? Will it be accompanied by mutual understanding or confrontation? Only time can provide an unequivocal answer to that question.

Something else is clear now. Some 75 percent of the cadres of the army are communists. They joined the

party voluntarily, and the majority still do not intend to leave it. The party affiliation and party self-awareness of these people is a powerful stimulant for combat readiness and discipline. Depriving communists of the right to participate in party life would be, on the one hand, a non-democratic act and, on the other, a jumping ahead, while also, most importantly, depriving a considerable portion of the army a mighty factor for self-indoctrination and self-awareness.

The results of the discussion of Article 16 of the Public Organizations Law in the country's Supreme Soviet testify to the fact that this is understood by the serious and responsible people who have been endowed with the trust of the voters. Advocates of the complete deparitization of the army, MVD [Ministry of Internal Affairs] and KGB were defeated. The law, which went into force starting 1 Jan 91, says that servicemen and individuals occupying positions in law-enforcement bodies, whatever party or social movement they belong to, should be guided in their activity only by the requirements of law, and cannot be connected with the decisions of the movements of which they are a part.

The ideas and suggestions expressed in this article in support of the positions of the 28th CPSU Congress in relation to the slogan of the depolitization of the army in no way pretend to be the ultimate truth. The further development of political processes in the country and in the army will possibly lead to the necessity of taking some other steps. But conclusions today must be drawn from the prevailing conditions. And they are such that the majority of communists and non-party servicemen, including fliers, are against the depolitization of the armed forces and feel it necessary to preserve the institution of the political bodies, restructuring it in accordance with the requirements of the times and the tasks of military reform.

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### Inquest Procedures Explained

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[Answers to readers' questions by Colonel Justice K. Kozlov under the rubric "Law and the Army": "Performing an Inquest"]

[Text] *A previous issue of the journal mentioned the performance of an inquest in a legal consultation on the material liability of servicemen. This topic, as testified to by the letters, interests many commanders and superior officers. Colonel Justice K. Kozlov answers the questions of readers.*

[Question] What is an inquest, and what legal documents regulate it?

[K. Kozlov] An inquest is one form of preliminary investigation of crimes, which is in turn a stage in

criminal legal proceedings. It is regulated by nationwide and republic legislation, consisting first and foremost of the Fundamentals of Criminal Legal Proceedings of the USSR and the union republics and the criminal-procedure codes.

The inquest bodies in the armed forces of the USSR, in accordance with Article 29 of the Fundamentals of Criminal Legal Proceedings of the USSR and the union republics, are represented by the commanders of the military units and formations and the chiefs of military institutions. Their tasks and procedures in performing an inquest are defined by the instructions that took effect by order of the Minister of Defense of the USSR in Order No. 1 of 1978. It defined an inquest as an investigation of crimes performed by decree of a commander of a military unit by an inquest officer in observance of the requirements of the criminal-procedure code. The instructions are presented in the Reference on Legislation for Officers of the Soviet Army and Navy that was published by Voenizdat and is available for sale.

[Question] Who can be an inquest officer?

[K. Kozlov] The inquest officers are designated by order of the commander of the military unit, from among the officers best prepared for it, for a term of two years, with 5-6 for a regiment, 3-4 for a detached battalion, 1-2 for a detached company and 2-5 for a headquarters (above a regiment) and institution (military training establishment). The most experienced and skilled officers in performing an inquest are designated the senior inquest officers. A serviceman who is not among the inquest officers who were determined earlier may also be assigned when necessary for a specific case.

A copy of the order to designate inquest officers is sent to the military procurator. The military inquest officers, according to the plan of the commander of the military unit as coordinated with the procurator, subsequently take part in training assemblies and complete an internship at the procuracy in order to obtain practical skills in investigating crimes.

The rights and obligations of the inquest officer are set forth in the Instructions to Inquest Bodies in the Soviet Army and Navy.

The inquest officer may not take part in investigating the case, and is subject to rejection if he is a superior officer or official in relation to whom the criminal case has been brought by service position, as well as in the presence of other grounds indicated in the articles of the criminal-procedure codes of the union republics.

An inquest officer is obligated to report the presence of grounds for rejection to the commander of the military unit and the military procurator. His participation in an inquest that was performed earlier for a given case is not cause for rejection. The question of rejection is resolved by the military procurator (Article 64 of the RSFSR UPK [Code of Criminal Procedure]).

[Question] How should the inquest begin?

[K. Kozlov] An inquest—as opposed to an administrative investigation, which is conducted according to the facts of the offenses—begins with the institution of the criminal case.

The commander of a military unit, having received a report of a crime having been committed, institutes criminal proceedings that same day and issues the corresponding decree for that purpose. It should indicate the time, place, grounds and basis for instituting the proceedings, the article of the law according to the criteria of which it is instituted and the names of the inquest officers who are entrusted with the investigation.

The commander immediately notifies the military procurator of the crime and the inquest that is started for it.

The inquest officer, having received the decree to institute criminal proceedings, issues a decree on his acceptance of it for execution. The unit commander is obligated to send copies of those documents to the military procurator no later than 24 hours from the moment the criminal case is filed.

The unit commander, in the event an individual has committed a crime that is of little significance or does not pose a great public danger and when the facts of the crime are obvious, while the individual who committed it can be corrected using social influences without instituting a criminal case, submits the materials for the consideration of a comrades' court, or the accused is turned over to the collective of the military unit for re-education. He issues a decree on the rejection of criminal proceedings in all such cases, and a copy is sent to the military procurator.

For example, having received materials regarding a traffic accident from the organs of the GAI [Main Automobile Inspectorate] and having ascertained that no one was injured in the accident, the commander orders an administrative investigation in order to clarify the circumstances and determine material damages. Say it is established in the course of it that a driver, a conscript serviceman, is to blame in the collision of the vehicles, and that it caused material damages in the amount of 850 rubles as a result of the careless performance of official duties. The unit commander, with the consent of the military procurator (according to prevailing practices, this consent is sought if the material damages do not exceed 1,000 rubles), issues a decree regarding the waiver of a criminal case. A copy of it is sent to the procuracy and an order is issued on the material liability of the guilty with the reimbursement of damages in the amount of 1,000 rubles. The unreimbursed portion of the damages remaining is written off on the basis of materials of the administrative investigation according to the inspector's testimony. The victim—the driver of the vehicle—is reimbursed in full for material damages by the military unit.

[Question] How is an inquest performed in the investigation of criminal cases?

[K. Kozlov] For cases for which the performance of a pre-trial investigation is not required (the list of them is defined in Part 1 of Article 126 of the RSFSR UPK and the corresponding articles of the UPKs of the other union republics), the inquest officer conducts a complete preliminary investigation of the crime right up to the composition of the bill of charges, which together with the criminal case is sent immediately to the military procurator by the unit commander for approval and transmittal to the court.

In the presence of grounds stipulated in the law, the commander halts the criminal case, for which a decree of motive is composed, signed by the inquest officer and approved. A copy of the decree on halting the criminal case is sent to the military procurator within a day's time.

The performance of an inquest for a criminal case should establish, in accordance with Article 10 of the Instructions to Inquest Bodies in the Soviet Army and Navy, whether a crime was actually committed and just what it was, the place and time, under what circumstances, by what method, with the use of what means and implements, who committed it, detailed information describing the individual, for what motives and with what aim, the causes and conditions facilitating the commission of the crime, its consequences, the nature and size of the damages caused, the circumstances affecting the degree and nature of responsibility of the accused as indicated in Articles 38 and 39 of the RSFSR UPK and other circumstances that have material significance to the case (Article 68 of the RSFSR UPK).

The presence or lack of a crime, as well as the conclusion of the guilt of the individual who committed it, should be confirmed by the actual facts (evidence) in accordance with Article 69 of the RSFSR UPK.

It is established by the testimony of witnesses, victims, suspects and the accused; the conclusions of experts; physical evidence affiliated with the case, the minutes of investigative actions and other documents.

The inquest officer, for the fulfillment of the tasks of the investigation and the establishment of the truth of the case, has the right to take the following actions as envisaged by law: inspection of the place of the event, terrain, objects and documents with significance for the case; the inspection of the place of the incident can be performed before the filing of a criminal case in cases that cannot suffer delay, and criminal proceedings are instituted after the performance of an inspection of the place of the incident immediately upon the detection of grounds.

If there exists the necessity of removing certain documents or objects that have significance to the case, and it is precisely known where and with whom they are, the

inquest officer performs their removal under a decree of motive approved by the commander of the military unit.

In the presence of sufficient grounds to suppose that implements of the crime, objects or valuables obtained through criminal methods, as well as other objects or documents having significance to the case or to the detection of individuals being sought, the inquest officer may conduct a search under a decree of motive, and only with the sanction of the military procurator. In cases that cannot suffer delay, the search may be conducted without his sanction, but with the permission of the unit commander, and is reported to the military procurator within a day's time.

A hold on mail may be imposed or its removal from a postal or telegraph institution performed under a decree of motive with the sanction of the military procurator.

Physical evidence that has significance for the case is affiliated with the case by decree of the inquest officer after its inspection and detailed description, and where necessary photographing as well.

The inquest officer, aside from the enumerated investigative acts, also has the right to question witnesses and victims, perform identifications and confrontations, designate expert appraisals, make accusations, select restrictive measures and perform other essential investigative actions envisaged by the criminal-procedure code.

Cases for which a preliminary investigation is not mandatory should be concluded in a month's time, which may be extended where necessary by the military procurator.

If the performance of a preliminary investigation is mandatory (and that includes all cases of military and general crimes with the exception of those indicated in Part 1 of Article 126 of the RSFSR and the corresponding UPKs of the other union republics), such cases are conducted in a different fashion. Here the activities of the inquest bodies are limited to the performance of immediate investigative activities to reveal and consolidate the traces of the crime, detect material evidence and establish the criminal, victims and eyewitnesses to the crime. The inquest should be completed no later than ten days from the time of the institution of the case. The criminal case must be turned over to the military procurator or the military investigator upon the completion of the immediate investigative actions, and not later than the stipulated time period.

Such strict time periods are stipulated for the purpose of the rapid and skillful investigation of the crimes and the establishment of the truth for the case.

In accordance with Article 119 of the RSFSR UPK, in the event of the commission of a crime for which the performance of a preliminary investigation is mandatory, the commander of the military unit, as the inquest body, should immediately inform the military procurator of the crime that has been ascertained and, before

the arrival of the military investigator, take steps to protect the scene of the crime. If an opportunity for the immediate arrival of a military investigator is lacking, as well as upon the instructions of the military procurator, the commander is obligated to institute criminal proceedings and, guided by the rules of criminal-procedure law, to provide for the performance of the necessary and immediate investigative actions by the inquest officer, including inspection, search, removal and official examination, holding and questioning of suspects, victims and witnesses.

The inquest officer is released from the fulfillment of official duties and is provided, where necessary, with motor-vehicle transport and communications gear in all cases for the duration of the inquest.

It must be remembered that the state of the fight against crime in the armed forces in the USSR depends to a considerable extent on the timely and high-quality work of the inquest bodies.

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#### **Early Cosmonaut Training Center Director Remembered**

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pp 38-39*

[Article by Major-General V. Ponomarenko of the medical service, an academicien of the USSR APN [Academy of Pedagogical Sciences], and Doctor of Medical Sciences I. Allatov, under the rubric "Our Contemporary": "At the Origins of Space Science"]

[Text] Toward the end of the winter of 1960. A series of multiple-day test simulations for the first set of cosmonauts is being completed in the surdo chamber of the Institute of Aviation and Space Medicine at base TBK-12. These are the last estimates before the first launch in history of an Earth satellite with a person on board. The schedule of operations and research is packed full.

Early morning. The "junior" O. Gzenko, a future academicien, passes quickly through the facility housing the pressure chamber, greeting the members of the duty team. Behind him follows the young and imposing Colonel Ye. Karpov. They have only just returned from the cosmodrome where a biological satellite had been successfully launched. A physician, a lab worker (on this shift, by the way, was a future cosmonaut—physician B. Yegorov, at the time still a student in the 6th year of the 1st MMI imeni M.I. Sechenov) and a mechanical engineer were watching Karpov with interest—they had heard much about him, but had not yet encountered him up close.

It must be said that the start of practical space science was marked by especial intensity, acute emotion, the activation of scientific research and rapid reaction to its results. This was an interesting and unforgettable time

overall. And you feel the loss of those with whom it all began all the more keenly today...

Yevgeniy Anatolyevich Karpov—retired major general of the medical service, candidate of medical sciences, the first chief of the Cosmonaut Training Center [CTC] and the last of the legendary troika of the "chief designer," "chief theoretician" and "chief doctor," as they were, so often called in the reports on the flights of cosmonauts—left this life in May of this, his seventieth year.

Yevgeniy Anatolyevich was born in 1921 in the town of Kazatskoye in Kiev Oblast. His path in life was largely similar to the biographies of the whole prewar generation. Completing school, he needed to choose a profession. He liked two of them identically—regular military and physician. And he found a way to combine them, entering one of the oldest and most honored educational institutions of our country—the Military Medical Academy imeni S.M. Kirov. Yevgeniy Anatolyevich completed his training at the academy in 1942. Much has been written of the difficulty and drama of that period. We will only emphasize that the nature and human qualities of the young physician were formed under the conditions of the utmost sensitivity of a feeling of patriotic and professional duty against a background of adversity and deprivation.

The service of Ye. Karpov began in a long-range air division manned by experimental crews, many of whom took part in air raids on the capital of fascist Germany in August-September of 1941. The flight personnel were well acquainted with the self-disciplined, smart and likable doctor, who rapidly became part of the collective.

Such physicians as Ye. Karpov, with high professionalism and the best human qualities and having passed through the school of the Great Patriotic War, comprised a golden store of medicine to accompany space science in the early stages of its development. Yevgeniy Anatolyevich engaged in scientific work at the Institute of Aviation Medicine in 1947, and when the issue of the assignment of the first chief of the Cosmonaut Training Center came up at the end of the 1950s, the choice fell to him. Karpov resolved a whole set of new organizational, scientific-research and technical-methods problems in the compressed time periods dictated by the rapidly developing space science. An organization capable of resolving the most difficult tasks and having a great international reputation, even to this day, was created thanks to this. And, most importantly, a workable, well-balanced and promising collective was formed.

Yevgeniy Anatolyevich left for the institute once against after four years. And that did not happen because Karpov had not been able to handle the duties of the chief or had lost a sense of perspective. He was full of strength, new ideas and plans as before. But at that time, and later as well, the Center had acquired a special significance in the political and state structure of the country, and the higher leadership felt that it should be

headed by a general with a reputation, fame and popularity comparable to that of the first cosmonauts. The "doctor" was not now suited to that role. The medical-biological training of the cosmonauts had moreover lost its priority significance.

Returning to the institute, Yevgeniy Anatolyevich did not lose his ties with his pupils. Most of the first cosmonauts also preserved their affection for their first commander. It is recalled today how Yu. Gagarin, a week before his death, came out of his office after having embraced Yevgeniy Anatolyevich in excellent spirits, and their happy laughter resounded across the whole floor. German Stepanovich Titov supported Yevgeniy Anatolyevich as he could, visited him in the hospital when he was already gravely ill. There were, unfortunately, other examples as well. Some candidates for the cosmonaut corps, having surmounted the hidden barrier and crossed into the shining tomorrow, later demonstrated an unjustified and not always correct indifference. Even the "collective intellect" of the cosmonauts corps at anniversaries of the CTC was often unaware that they had to pay attention to the first leader of the Center, seated in the room.

But we return to history. When Yevgeniy Anatolyevich went back to the institute again, his creative forces were in full flower. His excellent mastery of medical and technical issues, foresight in the selection of promising topics, feel for the new and good organizational abilities allowed him to lay the foundation for solving such problems as the development of a classification system for the functional states of crew members and a conceptual framework for the health of a pilot, the significance of which would be fully manifested only today. He was awarded the rank of major general of the medical service at the institute (1966), although it would have been more logical, in our opinion, to have done that sooner—that is, when he headed the Center.

He transferred to the Ministry of Civil Aviation as supervisor of the aviation medicine branch of the GosNII GA [State Scientific Research Institute of Civil Aviation] in 1973. An automated multichannel system for preflight medical monitoring of flight crews was created under his supervision and with his direct participation. This development was marked with a series of certificates of honor. The majority of military specialists at the time, including Karpov, assigned to the MGA headed by B. Bugayev, were unfortunately subjected to unfounded attacks and discrediting during that period. The endless checks, malevolent conclusions of commissions and the like took their toll, and Yevgeniy Anatolyevich was not one to defend, justify or adapt himself. He retired in 1978 at the age of 57.

His later activity was connected with public organizations, first and foremost along the lines of the USSR Federation of Cosmonauts. He was constantly going out to republic sections, organizing new divisions and museums of space science, appearing with lectures and

papers and often filling the role of chairman of commissions for summarizing the results of children's competitions for the best results in the realm of space science. And today, when he is no more, the invitations, letters and telegrams are still coming in from every corner of the country with the request for Yevgeniy Anatolyevich to come again, speak to the pupils and students or the public with lectures on the history of space science or personal recollections of the people of this interesting and unforgettable period in our history. The man has gone, but his cause, constructive, just and promising, lives on.

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### Profitable Uses of Space Reviewed, Suggested

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pp 40-41

[Article by V. Lyndin under the rubric "Space Sciences for the National Economy": "Profitable Outer Space"]

[Text] It was announced on the eve of the launch of cosmonauts A. Solovyev and A. Balandin that the sixth principal expedition to the Mir orbital system would be the first whose results could recoup all of the expenses for conducting it. Preliminary figures were cited as well: 80-90 million rubles of expenditures (that is, the level of previous expeditions), while the income would total 105-108 million rubles. The principal profits were expected from the operation of technological installations, on which unique materials possessing properties that cannot be achieved under the conditions of production on the planet could be obtained in weightlessness. The Kristall module with five such installations, according to initial plans, was to be linked up with the orbital system in the beginning of April, but there was a two-month delay for various reasons. This could of course not help but affect the results of the expedition. The question is, how much?

Today, when we have begun to count money so zealously, economic problems have come to interest literally everybody. And we already know that the amount of unfinished construction in the country totals more than 180 billion rubles, with 247 billion of stockpiles beyond standard levels and 24 billion of production losses. Losses in the agro-industrial complex are valued at 20 billion rubles for grains and 5-6 billion for meat... What are the 6.9 billion rubles spent on the space program in 1989 compared with that! I will state for comparison that last year's space programs of the United States cost the taxpayers 29.6 billion dollars. And Soviet space science received 6.3 billion rubles in 1990 in the face of continuous growth in the space budgets of the United States, France and Japan and with an increase in spending on space in the developing countries. And only 220 million, rather than 300 million, were allocated for manned space

flights. Further reductions in appropriations are promised in the future. As they were saying in the recent past, "economics should be economical." But are we the only ones to economize?

But there are positive shifts as well. The calls incited by public opinion to "shut down the expensive space program" that were heard quite recently have been replaced with a more sober approach to matters. Glasnost was to "blame" for that, revealing the true costs of the space program and its still-unused opportunities.

It must be noted candidly that the attacks on the domestic space program are easily explained. Let us recall what a stunning effect the launch of the first artificial Earth satellite by the USSR had around the world, followed by the first flight of a person into space. This really was a collective feat. Having not yet fully righted ourselves from the consequences of the destructive war and without possessing the highest scientific, technical or industrial potential, our country was able to become the trailblazer in space, overtaking the acknowledged leader—the United States.

A "green light" was in fact given to Soviet space science after those successes. N. Khrushchev did not conceal his love of it and the subjugators of space. They stood on the tribune of the Lenin Mausoleum alongside the leaders of the state during holiday parades during those years. Space science occupied a special place later as well.

This heightened attention proved to be double-edged for it. On the one hand, enjoying this patronage, it was able to maintain the reputation of the USSR as one of the two leading space nations. On the other hand, thanks to the hue and cry that had unfurled around it, space science itself came to be perceived by the people as some sort of symbol of ostentation. Surrounded by a wall of excessive secrecy, it developed under far from the ideal conditions that it sometimes seemed to the uninitiated. The strictest requirements were made of the sector from the very beginning—create missile and space technology, making use only of domestic developments, materials, equipment, elemental base and internal technology therein.

The United States is in a more advantageous position in this regard. Having highly organized and developed industry and unique scientific centers, they could still borrow freely the latest scientific and technical achievements of other countries and attract outstanding foreign specialists. These competitive conditions were clearly not in our favor. The more so as the other sectors of the Soviet national economy that were feeding space science were far behind overseas ones. We were naturally forced to launch a larger number of satellites, having less advanced technology, to maintain the operability of space systems (for example, communications, navigation etc.). The wager was placed on the use of cheaper apparatus and launch vehicles as a compromise solution.

Outer space has already entered our lives so solidly that we sometimes do not notice its presence in our everyday practical activity. Many examples could be presented of

what space engineering is already giving to the national economy today and what it could give tomorrow. About 600 of the most up-to-date developments, for example, have been recommended for incorporation into the national economy as the result of the creation of the Energiya—Buran space/launch system alone. Here is what people whose competence on this issue is undoubted have to say on this score. The director of the Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy, Academician V. Barsukov: "We discovered nonoxidizable iron in the lunar soil. We started to study the nature of the phenomenon and clarified that the lunar soil had been subjected to intensive irradiation by the sun. This discovery is now being used on Earth as well. Essential and valuable parts are irradiated with protons and ions in order to prevent their corrosion. A protective film in the form of nonoxidizable pure iron is thereby created."

Not a bad illustration, perhaps, of the question of why we flew to the moon and what do we need with a flight to Mars. We offer the words of the deputy chief of the Main Administration for Geodesy and Cartography of the USSR Council of Ministers, Yu. Kiyenko: "Some 130 manifestations of minerals were detected from space photos in 1988. Some 438 sites were recommended for checking in the oil and gas industry in that same year, as well as 588 in 1987. Roughly 70-80 percent of them were confirmed."

The opinion of a leading specialist on space in the USSR Ministry of Defense, Lieutenant General V. Ryumkin, is not without interest: "We make use of a widely accepted technique for comparing results, and it shows that the efficiency of the space solutions compared to traditional methods of research provide a gain of up to 300 percent. Many of the tasks moreover cannot be resolved without space. Say, providing communications with remote regions of the country or a system for detecting missile launches... The information from space raises the operational effectiveness of the armed forces by one-and-a-half to two times."

It would not be superfluous to note that the rejection of the policy of military confrontation between the USSR and the United States would hardly be possible without satellite reconnaissance systems. Trust, but verify, as popular wisdom says. Objective monitoring of the processes of disarmament from orbit operates just according to that principle.

Assertions that interest in space science has dropped in our time have no foundation. The hullabaloo surrounding it has simply abated, giving way to a business-like approach. But the organizers of the press conference dedicated to the results of the sixth principal expedition to the Mir space station were apprehensive that they would pass unnoticed against the background of the other tempestuous events. But no fewer Soviet and foreign journalists assembled at the press center of the USSR MID [Ministry of Foreign Affairs] than for analogous functions during the years of "stagnation." Many

of the questions asked, however, differed in principle from the questions of those times. As did the answers, by the way...

Deputy flight supervisor V. Blagov cited the final figures. Eighty-four million rubles were expended on the sixth expedition, and the income is valued at 97 million. A space expedition was thus made with a positive net balance for the first time.

What are the components of the income?

Viktor Dmitriyevich Blagov cites three basic areas that are currently providing the greatest practical return. They are, first of all, the production of semiconductor materials in space for the needs of microelectronics. We had tested this technology as far back as 1969. More than 200 different experiments have been performed since that time, and much experience has been accumulated in growing monocrystals under weightless conditions and obtaining various alloys and superfine coatings. The output of the finished product in the production of semiconductor materials on Earth is measured in shares of a percent of the mass of the initial material. In space, specialists feel, one to two orders of magnitude more can be obtained.

Another promising area is biotechnology. The experience in working with this is more modest—just eight years. But the results achieved make it possible to affirm that it is time to move to the semi-industrial production of biologically active materials in space.

A great future lies before space technology. The annual requirements for pure materials in our country alone, after all, are valued in tons. A new generation of orbital systems with power ratios of 500 kilowatts or more are required to produce them. Income from the production of semiconductor materials and medicines in space by the year 2000, according to the forecasts of American specialists, could reach 20 billion dollars. One wants to hope that a considerable portion of that sum will be obtained by us. It would be very aggravating to miss such an opportunity. The more so as no country in the world other than the USSR has at its disposal the hardware allowing experiments in space for a duration of up to several months, or even years.

The third important direction is aerial photography of the Earth's surface. The start of systematic photographing and spectrometer analysis from orbit was made in 1971 during the flight of the Salyut station crew. A great store of data from photographs of the terrain of various regions of our country has been accumulated over the years since. Work has also been done under orders from other countries.

The new Priroda-5 photo system has been installed in the Kristall module. It includes two cameras with lenses that have focus dimensions of one meter and a resolution capacity of five-seven meters. More than 1,000 photos (2,000 frames) have been taken already using that

system. The basic task was to obtain an ecological map of the planet along the flight track of the orbital station.

Meticulous journalists began to try and clarify whether that money is real, that 97 million, or is a so-called hypothetical economic impact.

"That is the value of the materials produced in space as estimated by the economists of the Energiya NPO [Scientific Production Association]," answered V. Blagov. "We have fulfilled our mission. It is now a matter of incorporation, of customers—and then the money will become real. We all still need to learn commerce."

A department head at the Nauchnyy Tsentr NPO, Ye. Markov, noted that the thermal stability caused by the gravitational thermal convection impedes the growing of high-quality crystals on Earth. The difficulties in obtaining them condition their high cost as well. One gram of cadmium telluride on the international market, for example, is valued at 3,000 DM. Industrial production in space, in the opinion of specialists, will be cheaper than on the ground.

The Mir system now has six process installations on board. Three of them were created at the Nauchnyy Tsentr NPO. They are the Gallar, Krater-V and Optizon-1. Markov demonstrated prototypes of the materials manufactured in space. The chief of USSR Glavkosmos, A. Dunayev, took one of them and asked its value. The representative of the "firm" stated that he could give only an exceedingly rough estimate of the value of this sample, at 500,000 DM. But its price, of course, is higher, since the product cannot be obtained on Earth.

The cost of a single photograph obtained with the aid of the Priroda-5 photo system is valued at about 1,000 dollars. There is also the KAP-350 natural-studies camera on board, a video-spectral system, a multizone MKF-6MA camera, hand-held cameras... The cosmonauts say, true, that two people are not really enough with such an extensive system, the crew needs to be increased. But the main thing is to see that the customers of the space products, both current and prospective, have a vital vested interest in its fastest possible utilization.

The country unfortunately does not yet have an effective mechanism to stimulate the development of scientific and technical progress. Initiative in this area is sometimes just for show. Here is one example. The general director of the Planeta NPO, pilot and cosmonaut of the USSR V. Aksenov: "Once we tried to clarify what economic impact was obtained by geologists, agricultural workers, forest workers and fishermen thanks to our work. The Ministry of Geology reported 50 million rubles a year. The next year, representatives of that same ministry declared that, 'We get no impact from you fellows.' What was behind the change? It seems that the Ministry of Finance and the USSR Council of Ministers, having learned of that impact, subtracted those 50 million rubles from their budget for the next year."

Can space science be made truly profitable under such conditions?

I am reminded of a conversation with a specialist, one of the rank-and-file workers who does his business honestly without chasing after high positions and ranks: "They could in principle receive real money, rather than hypothetical money, to recoup their spending on the expedition. Through those same crystals, cutting back other areas or curtailing them altogether. One will of course hardly find customers for such an expensive product in this country, but foreign firms are ready to lay out millions of dollars without compunction... But for whom is that more advantageous? Our crystals, after all, would work in their technology, and we would be left to tread water. Ultimately, creating their own orbital station, they would reject our services. As a result we, hopelessly behind in technology, would be forced to buy from them the items created with the aid of our own crystals."

Here is the true price of this-minute profits! Perhaps it would not be a bad thing for those supervisors who are sending the goods so needed by our people overseas in the chase after hard currency to think about this a little. The state then has to obtain analogous items abroad, for hard currency of course, and at higher prices.

The Americans, whose practicality it has become fashionable to hold up as an example these days, feel it is advantageous for them to forecast the wheat harvest in the USSR with the aid of satellite observations. The corresponding prices for the sale of grain to us are then set according to the results of those forecasts. And we are not reducing our procurements of bread abroad in a record year for the harvest. Even today's unprecedented harvest itself, it turns out, was the greatest of surprises to us (but not the Americans!)....

The lack of incentives for the utilization of the enormous potential of scientific and technical achievements in this country is a general illness of our whole national economy. And the success of the treatment depends today on both the profitability and the fate of domestic space science.

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### Prospects for New U.S. Heavy Launch Vehicle Surveyed

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pp 42-43

[Article by Major I. Postovit: "Will There Be a 'Shuttle-C'?"]

[Text] The United States is currently resolving a very important problem for the assimilation of space—the choice of the future launch vehicle. One possible version of it could be the Shuttle-C transport space vehicle that was being developed in the interests of NASA. The existing plans are developing it as a launch vehicle able

to carry a payload weighing 45 tons into a circular orbit at an altitude of 372 km [kilometers] and an inclination of 28.5°, 42.5 tons into a polar orbit at 291 km or nine tons to a geosynchronous orbit, using the existing inter-orbital tow.

Despite the fact that it is a variation of the Space Shuttle reusable space transport vehicle (MTKK), there are substantial differences between them. The Shuttle-C, first of all, is not piloted, reducing considerably the requirements for flight safety, its cost and the launch itself. Second, it has a cargo stage in place of the orbiter, but without wings or heat shielding. The cargo stage will moreover have two BTsVM instead of five, and the fuel elements are replaced by batteries. The crew life-support system and the systems for leaving orbit and landing are also excluded. This stage becomes not only cheaper overall, but the time for its pre-launch check is also reduced considerably, since it is a non-reusable portion of the Shuttle-C. Repeated utilization is proposed only for the solid-fuel boosters.

The installation of SSME rocket engines that have already worked through their service lives as part of the Space Shuttle is planned for the cargo stage of the Shuttle-C. We would note that they were planned for a life cycle of 55 flights. It became clear in the process of operation, however, that their reliability could support no more than 20. NASA, proceeding from the likelihood of possible failures, dropped that value to 10. The engine undergoes a complete check-up after the completion of that service period, with the replacement of elements that reduce its reliability, ignition testing and installation on the cargo stage for the latest launch.

As we see, no special developments or the manufacture of new power plants and major assemblies were required for the creation of the Shuttle-C, which is the chief merit of that space system. Two or three SSME engines can be mounted on it, depending on the flight missions. This makes it possible to compensate to a sufficient extent for the traditional drawback of heavy launch vehicles—the virtual impossibility of complete utilization in operation.

Also being researched in the United States, aside from the Shuttle-C, are an upgraded Titan-IV launch vehicle, a new Titan-V launch vehicle, a new Space Shuttle-II MTKK, a transitional version of a launch vehicle with a modular structure and the future ALS launch vehicle, created on the basis of the latest achievements of engineering.

Research on all these rockets is being conducted in two directions, connected with valuing the cost of the life cycle and the effectiveness of the fulfillment of the possible missions. Spending on design engineering, development, testing, refinement, industrial production and operation are being counted in the first one. The possible tasks that the future launch vehicle is to perform were first delineated in the second area: putting objects

of the anti-missile defense system into orbit and performing major test programs within the framework of the SDI; launching satellites for military purposes, including with a considerable increase in mass; launching the Freedom orbiting space station into space by the middle of the 1990s and supporting the fulfillment of the extensive scientific programs of NASA; and, a flight to Mars or the creation of a base on the moon. It became clear after this that the fulfillment of these missions would require a heavy-lift launch vehicle able to support a quite high rate of launches.

The research was made more difficult from the very start by various types of uncertainties caused, in particular, by forecasting the total payload mass that it would be necessary to put into orbit. These figures range from 270 to 1,800 tons a year. The enormous importance of this question for the defensive capability and economy of the country was taken into account. Several mathematical models were used in the course of the work, including some that had already been verified in practice. The overall supervision was accomplished by the Office of Technology Assessment (OTA) of the U.S. Congress, with the involvement of a number of independent scientific organizations.

The research required large expenditures. Valuations were obtained after computer computations. These results were unequivocal for the Shuttle-C—that launch vehicle was one of the least economical or advantageous versions. The cost of launching a payload in it, according to the estimates of specialists, were on a par with those for the Space Shuttle, roughly 4,500 dollars per kilogram. This system was too non-economical at high and moderate launch rates (the following values were adopted in the research: 91 launches a year for a high rate, 55 for a medium rate and 41 for a low rate).

The number of launches that can be supported by the Shuttle-C is two or three a year. Even a non-specialist can see that that is insufficient to perform many missions, especially military ones. These limitations are connected with the number of engines that can be installed on the spacecraft and the throughput capacity of the launch equipment. If the production of engines is increased for a larger number of launches, that would raise the expenses sharply (one engine costs about 40 million dollars). The building of additional launch complexes would be required as well. And that means that the advantages in the time for creation and size of the expenses for development that the Shuttle-C had over the other rocket variations would be eliminated.

The spending on modifications of the launch complex at the Kennedy Space Center to support only 11 launches of the Space Shuttle and three Shuttle-C vehicles, according to the estimates of NASA specialists, would be 20-50 million dollars a year. If the number of launches were increased to 20, an additional mobile launch platform and installation and testing wing for the solid-fuel motors would also be required.

All of this does not signify, however, that the Shuttle-C should be rejected out of hand. It has a large advantage over all other versions, for example, in the performance of such missions as the launch of the Freedom orbital station. That consists of the fact that the launch vehicle could be created in less than four years and, as has already been noted, with lower expenditures. The lift capacity of the Shuttle-C will moreover make it possible to put elements of the station into orbit in larger groups than could be done using the Space Shuttle. The modules of the station, that is to say, would be sent into space fully equipped and tested on the ground. If the MTKK is used, the modules will have to be equipped and tested in orbit, which increases the risks enormously for the astronauts while lowering the reliability of the station and increasing the time period for its operational start-up from 19 to 36 months. And that is not all. Only seven flights of the Space Shuttle and five of the Shuttle-C will be required to put the station into orbit, instead of 19 by the former alone.

The Shuttle-C, aside from performing the functions of launch vehicle, could serve as a test base for new elements of the Space Shuttle reusable space transport system, especially for improved solid-fuel motors and liquid-fuel engines. This would rule out any risk for the astronauts or danger of losing the expensive space station.

The Shuttle-C entirely meets the requirements for space flights to Mars and the moon. It thus cannot be ruled out that the U.S. Congress could halt its choice of that launch vehicle, at least, for a period to the year 2010, that is until the moment when the operational term of the Space Shuttle reusable space transport system comes to an end. Congress intends to make the decision on the choice of a variation of a heavy-lift launch vehicle at the end of 1990.

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### Problems With First Proton Satellite in 1965 Discussed

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[Article by Colonel (Reserves) I. Zamyshlyayev under the rubric "Space Flight Support": "Signal Suitable for Processing..." (conclusion—for beginning see No. 11)]

[Text] The higher-ups were basically satisfied with the successful launch, and just V. Chelomey, as the general designer and supervisor of the collectives that had created both the launch vehicle and the satellite, displayed great interest in the possibility of "reviving" the spacecraft. He strengthened our operational group with representatives of his own enterprises for that reason, specialists in the on-board equipment, who were very competent and knew their business very well, it must be said. They advanced and refuted a host of possible reasons for the absence of a signal. The second day of the

flight passed, and the program to check the proposed explanations was having no results. The last suggestion was finally all that remained—a break in the transmission line running from the transmitter to the antenna, after it had opened up in space.

That meant that a signal, albeit a very weak one, should still “trickle across” at the place of the break. Many by this time did not believe in the possibility of receiving any telemetry, even if this could be corroborated. The signal would be at the level of the interference, and we would hardly be able to receive it. Interest in our work dropped. We selected the orbit with the most favorable conditions for observation by the Moscow NIP [ground tracking station] to check for the emission of a weak signal. I was sent to the station this time so as to be personally convinced of the results of the search for a signal.

The personnel of the NIP raised the antenna according to the computed target designators at the appointed time, and checked the tuning of the receiver channel. A noise signal barely varying in amplitude flickered across the greenish background of the cathode-ray indicator, and nothing but the interference was visible. The hypothetical zone was approaching an end, and hopes were waning. Suddenly a chain of narrow pulses of the correct shape flashed and disappeared for a second a little above the interference. A signal? Or just the appearance of it? But no, the others had seen it as well. But they could not catch any more, no matter which way the antenna was turned. The idea of the broken feeder line had seemingly been confirmed.

The next day there were furious debates: what to do now? We came to the conclusion that the sole possibility for the more reliable receipt of a signal was the use of the high-directional TNA-400 antenna with a diameter of 32 meters at the Crimean NIP. True, it was intended for targets in deep space, and had moreover never been linked up with such a telemetric station, while orienting it to a low-orbiting satellite caused a series of limitations—greater angular velocities, a dead zone in the ratio. Its use, in short, was problematical. Opinions were expressed that even if we were able to receive a signal, there was no guarantee that it would be suitable for decoding. But there was no other course of action.

It was decided to send a delegation of representatives to the NIP in the Crimea. It was imposing, true, for the developer's part. V. Chelomey, having learned of the apparent hope, sent the deputy chief designers, and only a rank-and-file test engineer, Major V. Shchebrov, not even 30 years old at the time, went for us. Our chief, as it later turned out, was 100-percent correct. It was a skilled and intelligent worker who was needed here, and not a chief.

The control cycle of the Proton substantially complicated the receipt of information at one NIP alone on ascending orbits with a restricted zone of radio visibility

(four or five minutes). Information from scientific measurement apparatus that had been recorded on board over a day by on-board recorders had to be removed no less often than once a day. The continuity of the recording of the parameters being measured would otherwise have been disrupted. This signified that we had to turn on the on-board transmitter, detect a signal using the high-directional antenna, provide for its movement at a velocity exceeding the usual norm for tracking a satellite in orbit and, waiting for the required signal quality, issue the command to reproduce the daily information stored on board, all that no later than three minutes before the departure of the satellite from the zone of visibility of the NIP, all during the five-minute zone of radio visibility. Only under those conditions would it be possible to hope for the receipt of all of the stored information.

There could moreover be no interference or disruptions during the period of reproduction; otherwise the decoding of the signal would be made difficult or impossible, the same as losing it. These were the difficult tasks facing us in Moscow and V. Shchebrov at the NIP. I repeat that no one had any confidence in the success of the experiment, even with the involvement of the TNA-400 antenna. Many had already reconciled in their hearts with the “closing” of the object as a source of scientific information...

The decisive day arrived—July 22. The “review” was ordered, as it should, by V. Shchebrov, even though formally all of the necessary directives and initial data were issued from the Center. The NIPs, after all, could not and should not operate independently, since they were involved in the active management of the existing domestic space apparatus as a means of collective utilization and had to support the centralized planning and coordination of their operation.

Shchebrov, from his command post set up right in a special compartment in the antenna tower and where a portable indicator panel had been installed, could observe the signal coming in from the satellite and maintain contact with the teams of the command radio line (KRL) and the telemetry station, as well as the operational duty personnel of the NIP.

At the appointed time, as determined on the basis of a forecast of the movement of the spacecraft, the issue of commands to turn on the on-board transmitter was begun. The operator was to issue the commands to turn it on until a telemetry signal appeared on Shchebrov's indicators. Agonizing seconds of waiting, pulses of interference racing across the screen, the time passing with no signal. The satellite should already be overhead, if the forecast of its movement was true, but there was only noise on the screen as before. But as sometimes happens when you cease to hope, the long-awaited set of clearly visible pulses appeared unexpectedly at that very time and froze as if “rooted.” This was so unexpected that Slava at first did not even believe his eyes, followed by the thought, “Just don't disappear!”

The signal, as if responding to his mental request, was steady.

"We have a signal!" sounded in the loudspeakers.

"Signal-to-noise ration within the norm."

Twenty, thirty seconds passed—the signal was clearly delineated against the background interference.

"Issue RK-10," followed the command to the operator.

It could be seen how the nature of the signal was changing on the screen, this was the reproduction mode being turned on by command. The reproduction was completed literally fifteen seconds before the end of the zone of radio visibility.

"Receipt of signal concluded at 13:22:30," they reported joyously to the station.

The first problem had been solved, but what would the decoding say? Agitation ruled the room, one of Chelomey's deputies was already rushing to the HF to report to Vladimir Nikolayevich, but he was advised to wait. And now the awaited call: "The signal is suitable for processing..."

The routine voice of the decoder did not correspond to the solemnity of the moment. And only now could it be said that all of the aims of the launch had been fulfilled! That is how the personnel of the tracking command center "forced" a satellite, which later issued scientific information every day, to speak.

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